MODERN PLASTICS

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APRIL 1940

VOLUME 17 NUMBER 8

• GENERAL INTEREST

• TECHNICAL SECTION

• NEWS AND FEATURES

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MAY

Plastics got into furniture a long time ago, first as table tops that wouldn't scratch or burn, then as molded corners, handles and trim. But when transparent plastics came along, designers and decorators just made a business of pushing them to the front (see page 35, April issue) as custom pieces of limited production and distribution.

Now, Grosfeld House, pioneers and stylists in traditional and modern, has gone into production with a rather complete line of furniture in which Plexiglas is the structural material. Beds, tables, chairs, lighting fixtures, mirror frames, even room moldings, door lintels and mantels make use of this glass-like synthethic substance with rather startling results.

One of the new tables is pictured above. Read the complete story in our May issue.

Translucent INSUROK

GIVES TO OUTDOOR DISPLAYS NEW BEAUTY, BRILLIANCE, ATTENTION VALUE

● Among the many Translucent INSUROK outdoor illuminated installations three are illustrated on this page. At the top a store front of Putman's in Cincinnati; the train end display of a Nickel Plate Limited; a laundry sign in Chicago. Its physical characteristics, strength and workability, and resistance to the elements make Translucent INSUROK highly useful in numerous ways for display work. Get acquainted with this amazing new plastic. See how easily unusual effects can be accomplished, and how quickly extra attention value is added by the use of INSUROK. Available in many pastel shades and deep, rich colors, in sheets of various gauges, up to approximately 15 square feet in area. Prompt delivery assured.

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MODERN PLASTICS

APRIL 1940 VOLUME 17 NUMBER 8

1

COLOR PLATES, COURTESY TENNESSEE EASTMAN CORP.

Color and transparency persist

New materials quickly sponsored by aggressive manufacturers and designers

FOR a number of years now, interior designers have had their eyes on plastics and have been itching to get their hands on them because they saw so many opportunities in decoration where these new and exciting materials seemed to fit. Trouble was to find someone who could translate imagination into practical attractive merchandise and bridge the gap between creation and materialization.

No great amount of progress was made in really decorative pieces until transparent acrylic resins appeared in this country, first in sheets in 1936, then as molding compound in 1937. Then things began to happen in the interior design field. These transparent plastics, clear as glass but less fragile, excited the imagination of every designer who envisioned complete table settings of matching or contrasting colors; knives and forks with glass-like handles; even tables and chairs of unprecedented delicacy and charm.

This imagination was not shared, however, by the chemical minds which had created the materials and were dispensing all they could possibly make, for airplane cockpit housings, under order from the navy department. They saw their product as an industrial necessity in government and private enterprise. Viewing the decorative field through technical eyes, they saw nothing but small and troublesome orders ahead.

2

COLOR PLATES, COURTESY TENNESSEE EASTMAN CORP.

Tenite II, a comparatively new plastic, cellulose acetate butyrate, is being woven into gay and decorative porch and terrace furniture* 1-2. *The plastic compound is first extruded in continuous lengths by the Detroit Macoid Co., then woven into various patterns* 3-4-5 *of transparent or opaque contrasting colors to replace reed and rattan

Those who have watched the steady advance of modern design and decoration, however, know that any designer, worthy of his profession is not easily stopped once his enthusiasm is aroused. Even an emphatic "No!" or "Impossible!" will only bring forth a fresh multitude of reasons why such an answer cannot possibly be accepted as final.

Now the designer has won.

Manufacturers who cater to interior designers and decorators, as well as those who turn out kindred lines, have sensed this market and for some time now have been giving their best thoughts to the possibilities of introducing plastics into their products. Many have sought the advice of designers. Others employ their own designing staffs. But in either instance, more practical uses of plastic materials are turning up every day with the result that progress from now on should be rapid, indeed.

Plastic furniture and decorative accessories are not cheap. There is no reason why they should be. The materials themselves, when properly handled, have intrinsic value worthy of the price. They have advantages which no other materials possess. Craft work is always more costly than mass-produced merchandise and is worth the difference because of its individual character and charm.

On the other hand, plastic furniture is capable of production by modern manufacturing methods. So

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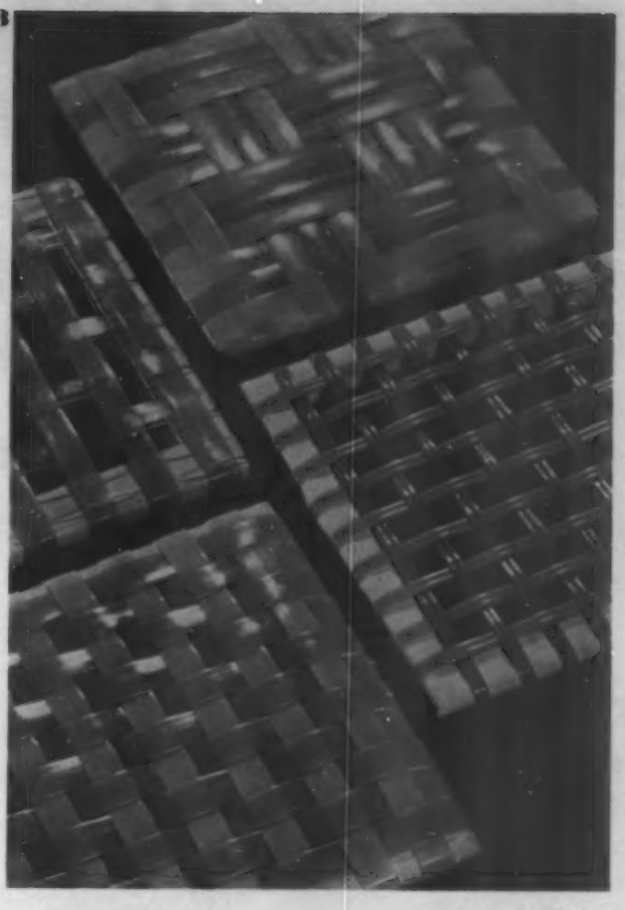

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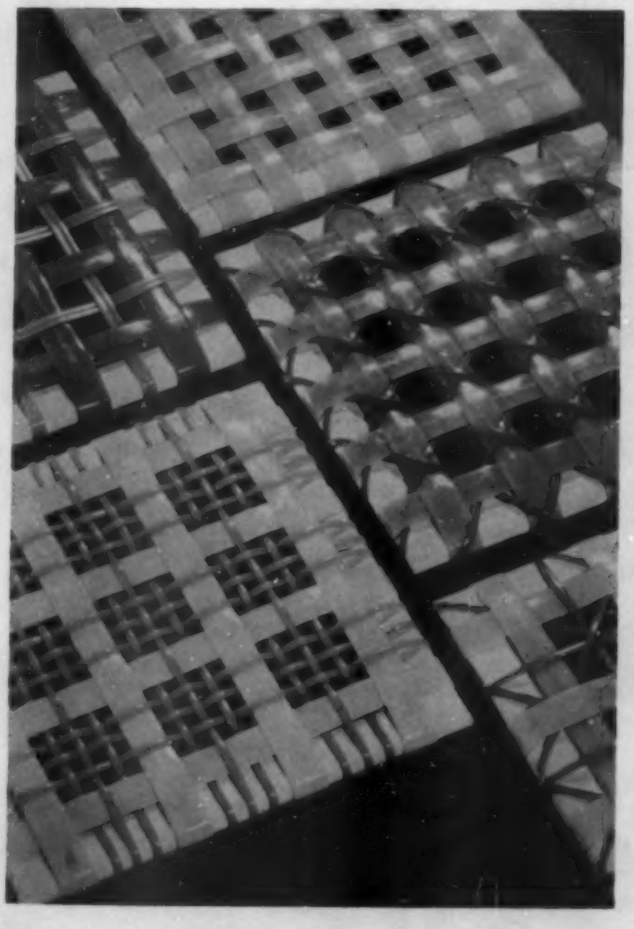

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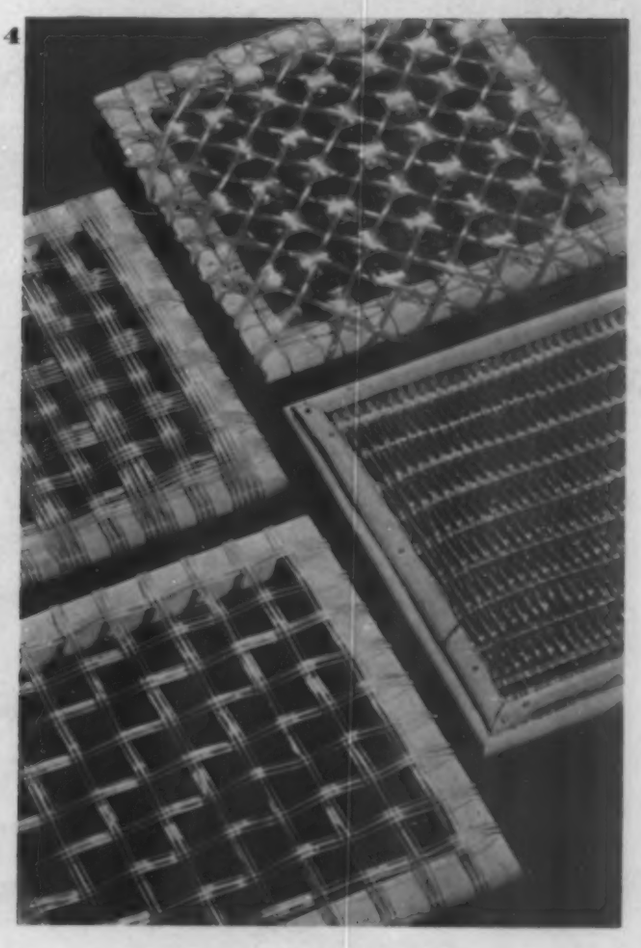

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This woven plastic screen **6** *permits entrancing patterns of light to play on the terrace and porch, provides ample ventilation, and forms a perfect background for the comfortable reclining chair. Both are woven from Tenite II. Your hostess? Oh yes! She is here to inform you that cellulose acetate rayon blouse and slacks are proper attire for comfortable and informal entertaining*

are lamps and innumerable other items which should bring them eventually within the reach of a normal budget. But there is no reason why they should *look* cheap if intelligent design is employed in their creation.

Perhaps the most recent example we could find as an illustration, is the new woven plastic furniture, admirably styled for use on terraces, porches and lawns, by the Ypsilanti Reed Furniture Company.

The plastic used is cellulose acetate butyrate, a comparatively new molding compound which comes in an endless variety of colors, and is exceptionally durable and strong. It has low heat conductivity, absorbs but little moisture and has excellent resistance to weather.

For a number of years, the Ypsilanti company has been searching for just such a material in order to give color and added durability to its outdoor furniture and when this new plastic came along, experiments were begun. The material was made available finally through a patented extrusion process which permits molding in continuous lengths of any desired shape.

The strands are cut and woven in the same manner as reed and rattan and countless different effects are achieved by using transparent, translucent and opaque strands of clear, or contrasting and harmonizing colors. The strands have the same smooth, sparkling surface which characterizes all thermoplastics.

Several samples were made up and put to rigorous tests of durability before this new line was introduced last January. For six weeks, the sample pieces were exposed to the sun, wind and rain, on the factory roof. This was done during a changing season with hot days and cold nights, and was a test estimated to equal several seasons of normal use. No change in the woven plastic could be noted. The six weeks of continuous exposure had only added a coating of dust and soot which was easily washed off with soap and water, leaving the plastic as bright and lustrous as before.

This same furniture was then immersed in water, hotter than hands could endure, for a period of 48 hours. The plastic still remained unchanged.

Two kinds of strands are used in the Ypsilanti Reed Furniture Co.'s present line. The more formal types of chairs, settees and tables, are made from half-round strips of small diameter. These are clear, transparent and are closely woven by loom to form a crystal-like matting (Fig. 2). Loosely hand-woven strips of transparent material $^5/_8$ in. in width, are used for the more rustic, lawn-type pieces (Figs. 1 and 6).

Custom furniture, fixtures and accessories of clear transparent plastics are increasingly evident in smart shops, hotels and night spots, where enchantment and

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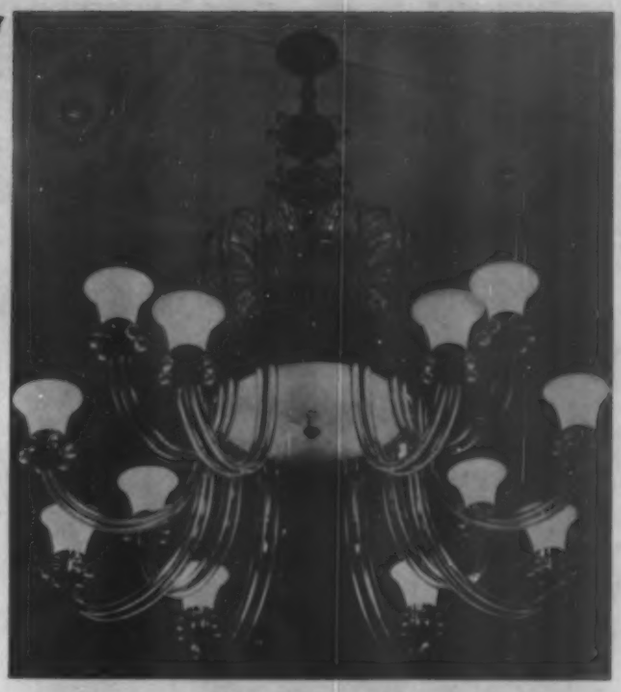

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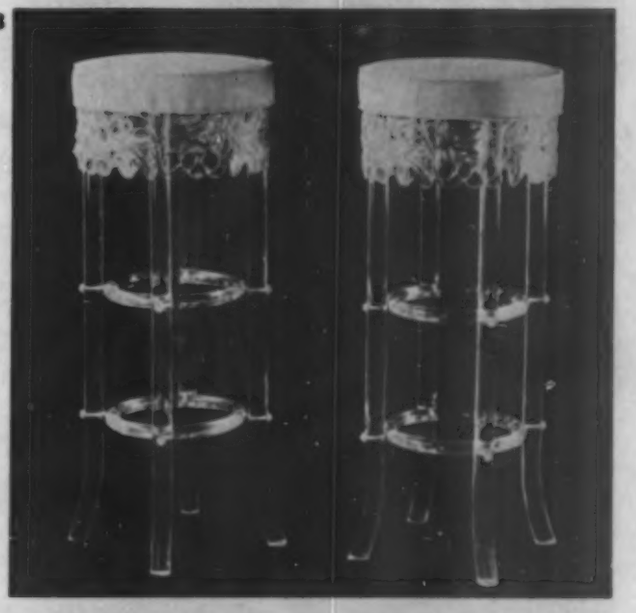

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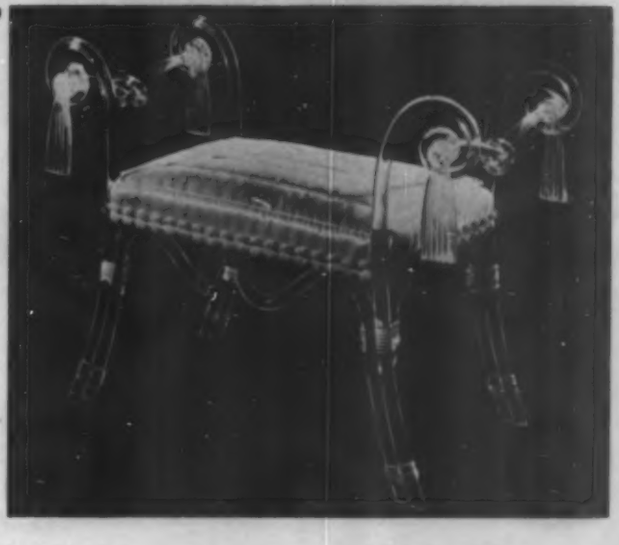

Dave Swedlow designed and fabricated this chandelier 7 for I. Magnin. The bar stools 8 and bench 9 were designed by Cora Scovil and turned out by Vazah, Inc., of which she is president. The plastic materials on this and the following pages are Lucite and Plexiglas

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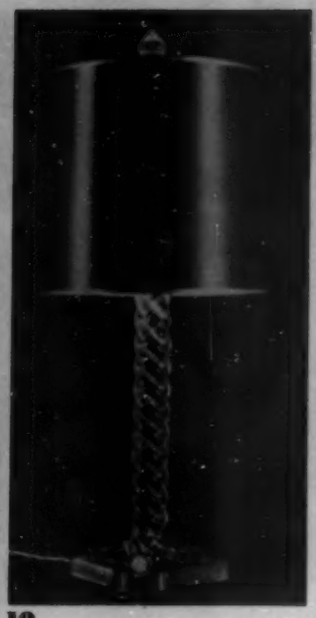

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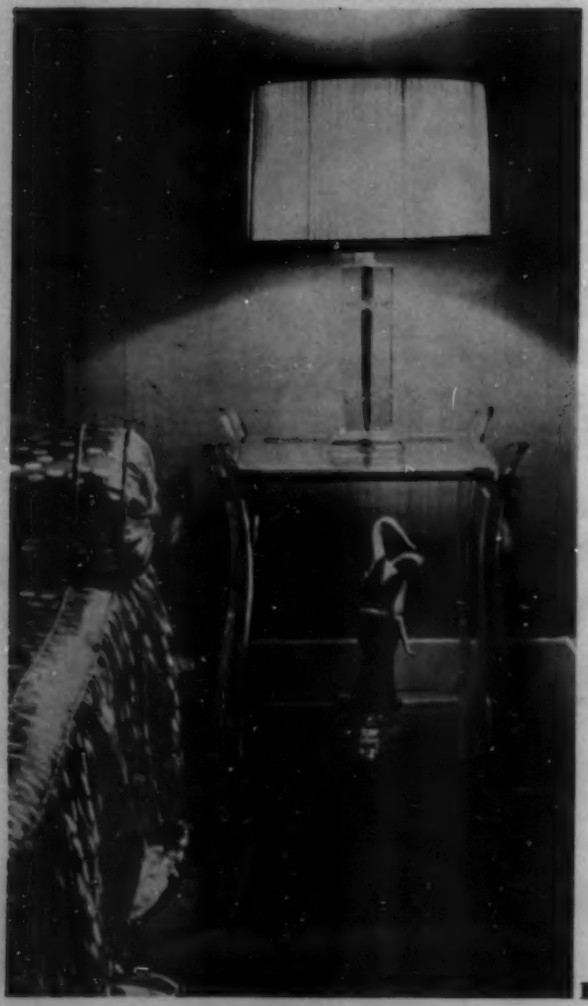
Lamps, **10** *designed by Scott Wilson, take full advantage of the light transmitting property of transparent plastics. Screen* **11** *was made for Saks, Beverly Hills. Bed and table* **12** *as well as above pieces, were made by Swedlow-Lehman*



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sophistication are high points in the merchandising plan. While costly for individual consumers, the charm of these personality pieces has gone beyond commercial applications and filtered out to set up a demand which designers and decorators find difficult to meet. Reason is, they are all craft pieces which take time to fabricate and assemble. The material cost is high, too, in comparison with contemporary materials more commonly used in modern design.

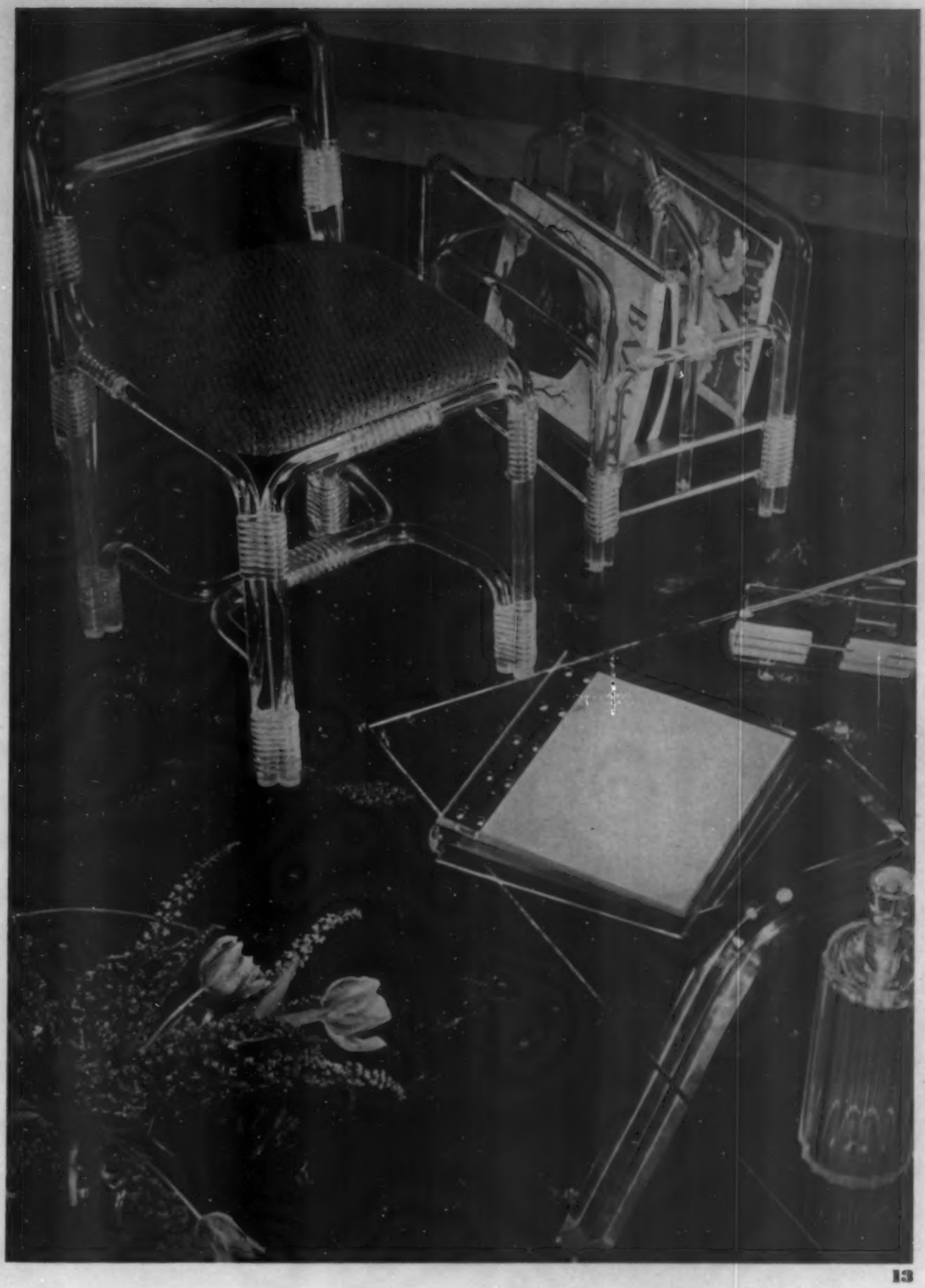
Experience gained by craftsmen engaged in the work is rapidly translating itself into efficient technique so that duplicate items can be turned out with savings in time and material loss.

All credit must be given to interior and industrial designers for whatever progress has been made in the furniture and decorating fields. Little has come from the manufacturer of materials except cooperation—and that, in the beginning, was not highly enthusiastic.

It is the whole-hearted enthusiasm, and persistent curiosity of these designers that have introduced plastics into their sphere of activity. And this same creative and imaginative genius will continue to assert itself in a way that will be exciting to watch.

This immediate space will not allow a detailed record of individual achievement, nor can we at this time do justice to the pioneers who have won the struggle to turn these new and interesting materials into things of beauty and use. We can only picture some of their recent work which we do with genuine satisfaction.

Next month we shall tell the story of Grosfeld House and show you how a furniture manufacturer goes into production with plastics.



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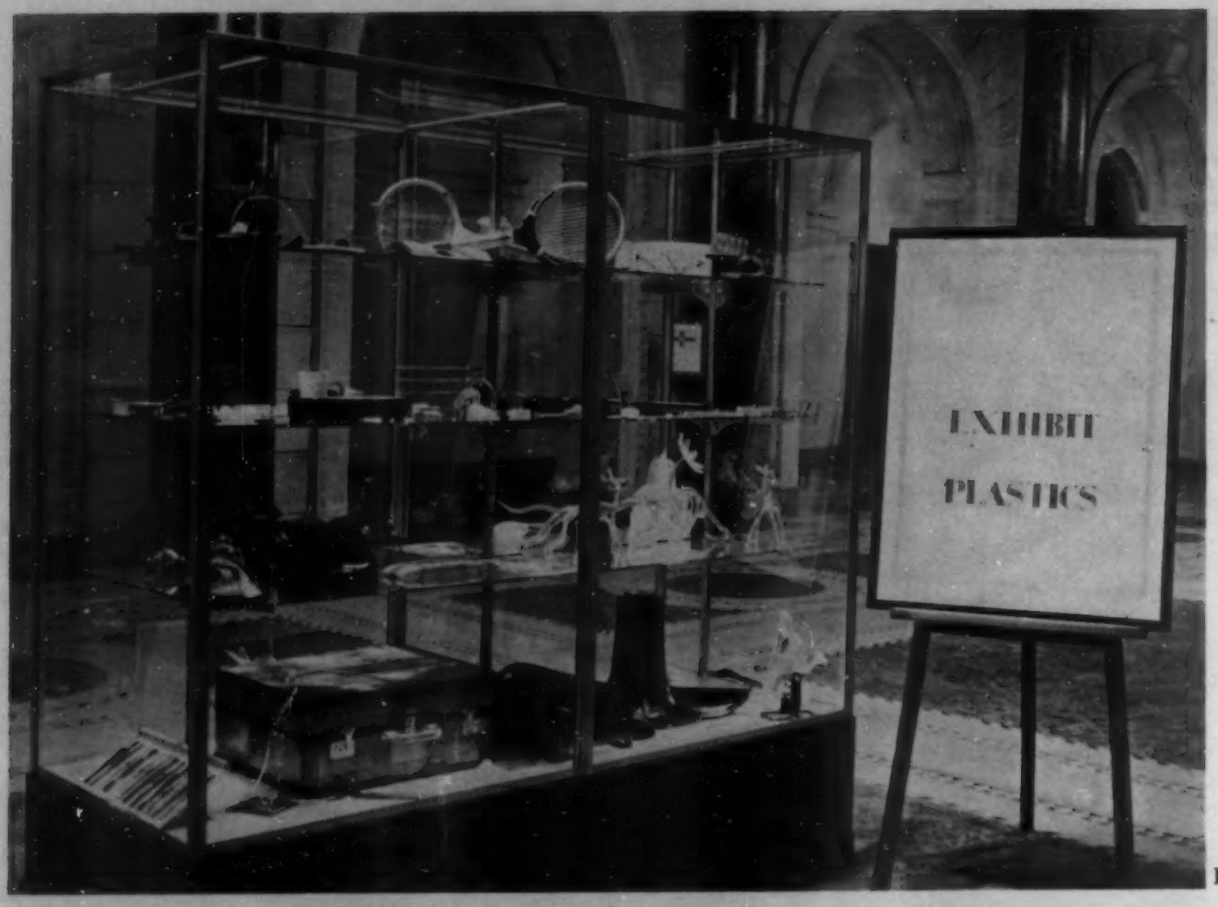
Fragile in appearance, though sturdy in structure, this ensemble **13** *by Swedlow-Lehman, reveals the diversity of decorator's items available for the Home of Today. Bending, twisting, winding and binding plastics is an art of which Dave Swedlow has become master*



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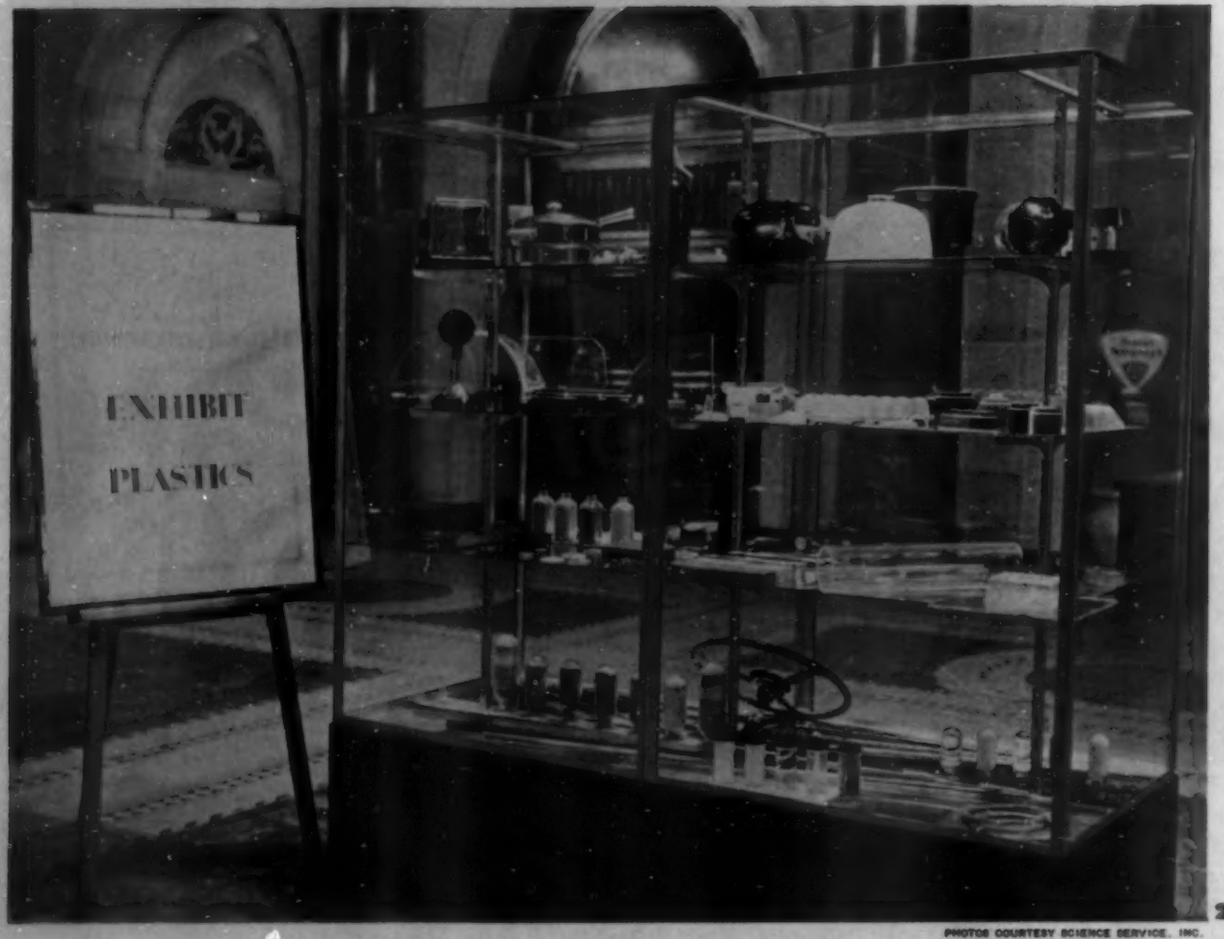

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PHOTOS COURTESY SCIENCE SERVICE, INC.

Winners in Washington

PROMINENT in the current exhibit of plastics in the lobby of the Commerce Department Building at the Nation's Capital are the Winners in MODERN PLASTICS' Fourth Annual Competition of 1939.

The Exhibit is sponsored jointly by the Chemical and Specialties Divisions of the Bureau of Foreign and Domestic Commerce, the National Bureau of Standards, the Bureau of Agricultural Chemistry and Engineering, the Cellulose Plastics Manufacturers' Association and individual manufacturers.

The display ranges in variety from automobile parts made from soybeans to jewelry and table decorations of synthetic organic glass. Also included in the exhibit are artificial teeth, sports and office equipment, kitchenware and many miscellaneous articles.

The past quarter of a century, and particularly the past decade, has witnessed a phenomenal growth in the manufacture of organic plastics in the United States, until today the plastics industry occupies a permanent and important place in the national economy.

In recognition of this important industry, and to acquaint visitors at the National Capital with its progress to date, the Exhibit was set up and opened to the public on March first. It includes raw materials as well as semi-processed and finished plastic products.

Through this public display, it is hoped to point out that plastics, generally speaking, are chemical substances, capable of being molded or otherwise fabricated into desired forms. They are the materials that give color and permanence to everyday familiar objects. Some of these are made from cellulose as a base, some from phenol—commonly known as carbolic acid—and others from certain coal-tar and non-coal-tar products.

Still others are obtained from animal and vegetable protein, such as casein from cows' milk, and from soybeans. There are over a dozen types of plastics now on the market which are found under a variety of trade names. New types are being introduced each year and new manufacturing methods, equipment and machinery are constantly being developed.

Definite data are not available but it is estimated in the trade that over 160 million pounds of plastic material (over a pound for every person in the country) are now being produced each year. More and more

Articles of interest to every member of the family, to sportsmen and businessmen, on view in the current exhibit of plastics in the lobby of the Commerce Department Building, Washington, D. C., are pictured in these pages. Representing some of the outstanding achievements in plastics during 1939, award winners in MODERN PLASTICS' Fourth Annual Competition are featured in the display 1-3. For the exhibit's opening, these young ladies 4 demonstrated the attractiveness and fit of nylon hose

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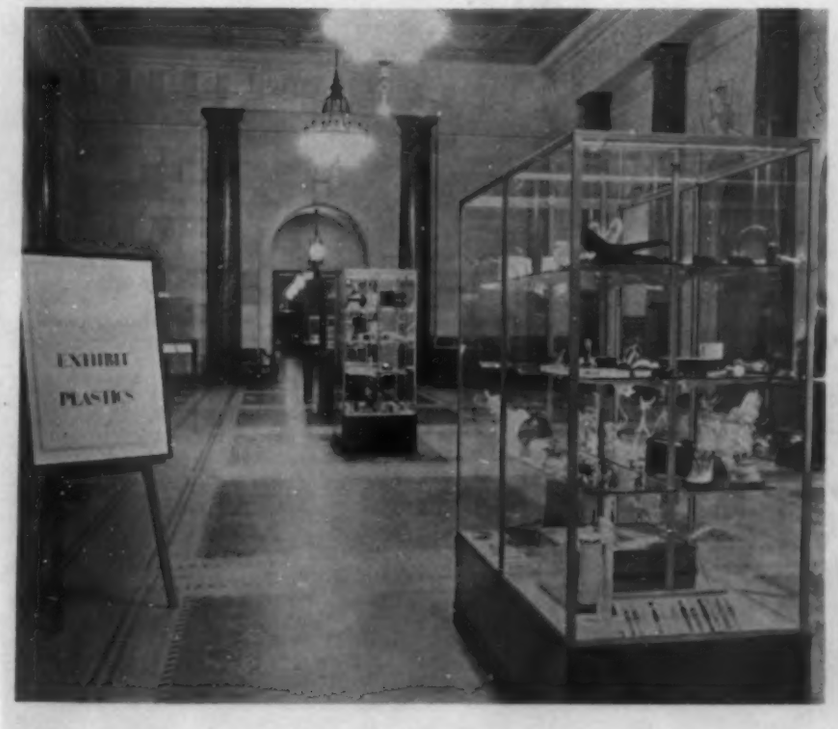

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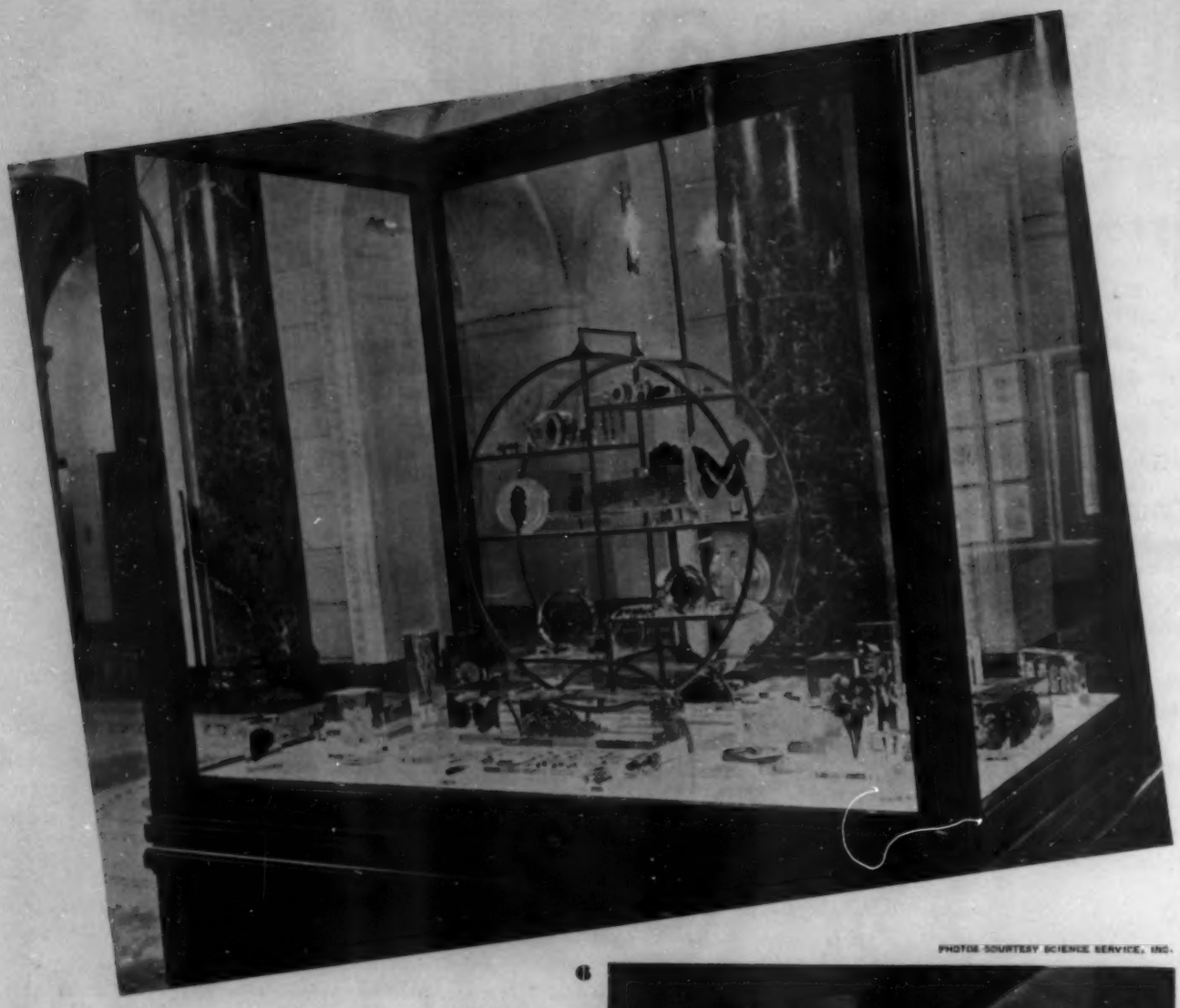

PHOTOS COURTESY SCIENCE SERVICE, INC.

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***Peanuts, corn, flowers* 6-8 *imprisoned in transparent acrylic, illustrate the method of preserving specimens for biological and botanical study, developed by Dr. Charles E. Sando of the Bureau of Chemistry and Soils, Department of Agriculture. Of particular interest to students and scientists, this process not only preserves samples permanently, in natural color and form but permits them to be viewed from any angle as shown in the display case* 5**

interest in the materials is evidenced by consumers and this exhibit provides the public with its first opportunity to see so many examples of plastics products in such a variety of industrial and commercial applications.

Outstanding among the special exhibits, is the work of Dr. Charles E. Sando, Bureau of Chemistry and Soils, U. S. Department of Agriculture.[1] Dr. Sando has employed the transparent, crystal clear, and permanent qualities of acrylic plastics to embed agricultural and biological specimens for permanent preservation.

Dr. Henry G. Knight, Chief of the Bureau of Chemistry and Soils, published a preliminary paper on this interesting development in *Science*, Oct. 8, 1937.

Biological and botanical specimens were formerly preserved by pressing and drying, or by immersing in liquids. Both methods had disadvantages because through pressing and drying, the specimen lost its natural color and became too fragile for permanent preservation. The second method permitted the natural color to be preserved for only a limited time and the containers were bulky and fragile.

The method developed by Dr. Sando, of embedding specimens in a transparent plastic, makes it possible to keep specimens indefinitely with complete preservation of their natural shapes, sizes and colors. The mounted specimens may be viewed from any angle, are relatively light in weight, and due to their permanence, should be very useful as records of healthy and abnormal specimens for scientific research, for educational purposes and for exhibition.

[1] Modern Plastics, November 1938, page 36.

The method is by no means simple and its costs are too high for commercial use. Dr. Sando spent three years in developing the experiment to a point where satisfactory results are assured.

Specimens to be embedded are first dehydrated, then immersed in monomeric methacrylic esters which polymerize to give hard colorless transparent solids. The liquid monomer is polymerized to a sirup by adding a catalyst and heating, and the specimen is immersed in the sirup in a mold.

Entrapped air is removed by placing the immersed specimen in a tight container and evacuating.

The hardening is then completed with carefully controlled heating, which sometimes takes many days. When the plastic is hard, it is taken from the mold and is given a special treatment to prevent subsequent crazing. Then the plastic is machined to the desired shape and polished to a high luster.

The spectacular result of this research and development reveals the trend of active imagination rampant in scientific as well as commercial and industrial fields.

Designers, decorators and furniture manufacturers have taken hold of these materials and turned them into unique, original and useful products as the foregoing pages will show.

The exhibit in Washington, however, is of even greater importance to the plastics industry, and to the public as well, because it focuses attention on a young and healthy industry which, within a comparatively short time, has reached a point of development worthy of this national recognition.

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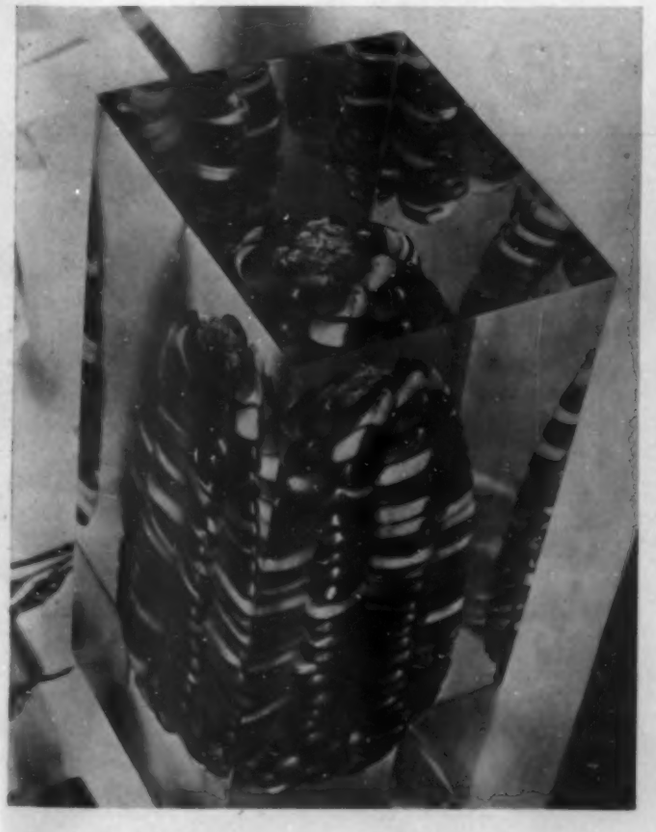

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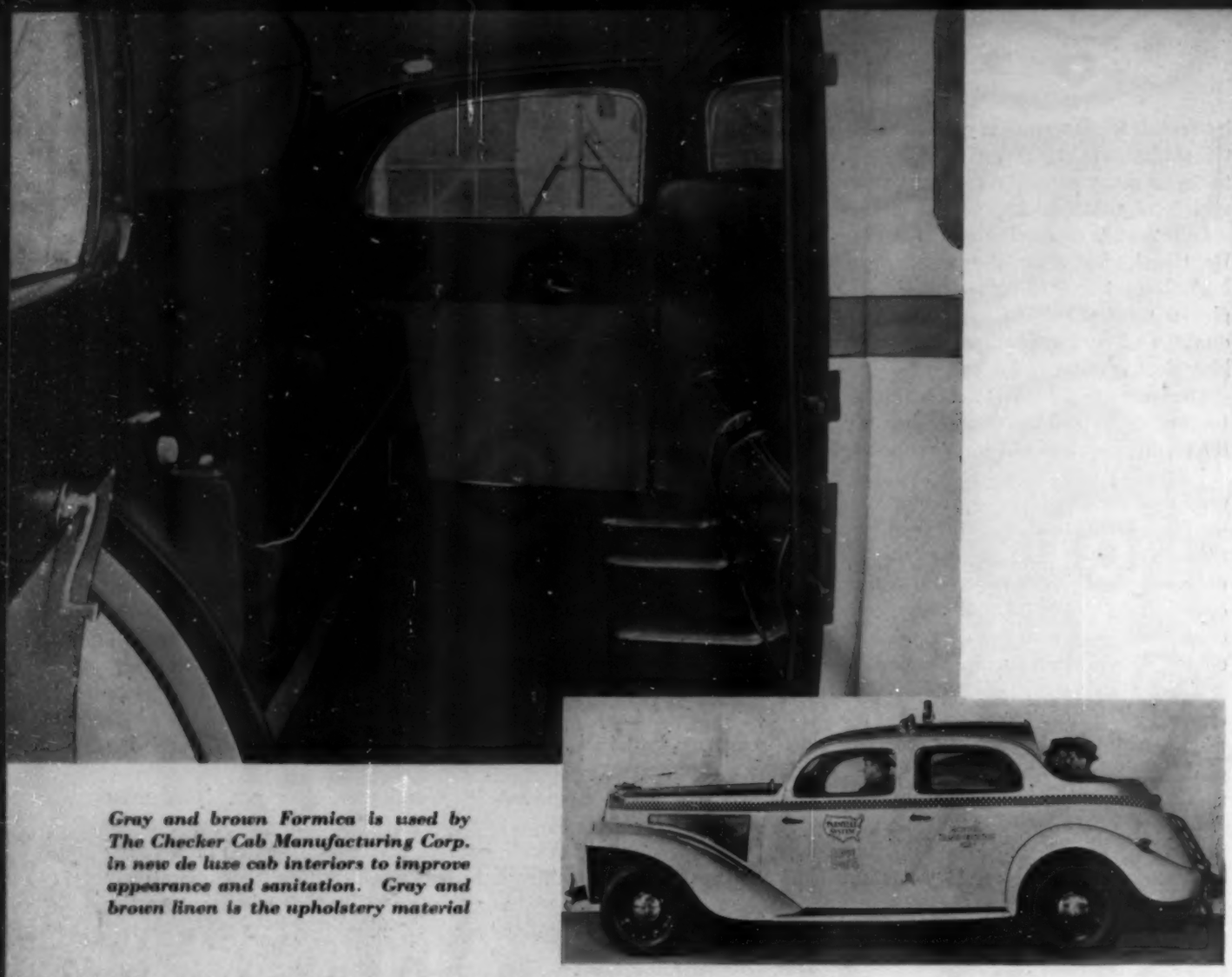

Gray and brown Formica is used by The Checker Cab Manufacturing Corp. in new de luxe cab interiors to improve appearance and sanitation. Gray and brown linen is the upholstery material

Fresh air taxi

The low-slung, sporty looking convertible that has become so popular in the last few years is the envy of many a pedestrian who jumps out of the way as it whizzes past with top down and engine purring. The man who *doesn't* own one may be glad to know that he can ride in one almost any time he pleases, come summer. For The Checker Cab Manufacturing Corp., entering right into the spirit of the times, has concocted a brand new type of taxi with a landaulet top which the driver can flick up or down in a jiffy.

And that's not all. The new cabs are tricked out with many little conveniences that both the driver and the passenger will appreciate. There's a hill-hold operated in conjunction with the clutch which keeps the car from rolling backwards on hills; a back-up signal—a loud buzzing sound that goes into action when the gear shift lever is thrown into reverse; a light on the instrument panel which flashes a warning if the doors are not closed tightly; a gas tank tell-tale that whistles when the tank is filled to within $\frac{1}{2}$ inch of the top.

Worthy of special mention are the smart interiors with their plastic paneling on the inside of each door, across the back of the driver's seat, and as backing on the auxiliary folding seats. It hasn't always been easy to make cab interiors look fresh and neat even with the general practice of washing out the inside of the cab each night with a disinfectant solution. The reason for the generous use of plastic material in the Checker cabs is that it not only looks clean, but is clean. Its lustrous surface, which is just about scratch-proof, is not in the least affected by the disinfectants used and doesn't look old or worn no matter how many scrubbings it takes.

The Checker Cab Manufacturing Corp. expects to have some 4000 of these cabs cruising the streets by summer. A good part of these will be operated by the Parmelee System and the others by smaller fleets and owner-drivers.

"Once around the park, Tony—and put the top down!"

Molding photographic history

by C. R. SIMMONS*

Economics made possible with molded plastics have stimulated the production of cameras and accessory supplies

THE tremendous growth of the photographic hobby in the United States during the past few years has been definitely paced by a huge increase in plastics consumption by the photographic equipment industry. Conversely, it seems true, too. Although photography has long been with us, its expansion has unquestionably been materially affected by the introduction of molded plastic cameras, developing trays and tanks, exposure meters, tripod devices, and the like.

Surprising as it may seem, only the last few years reveal an uncurtailed adoption of plastics by this industry as a whole. Yet phenolic plastics have been commercially available for more than thirty years. As one reviews the history of plastics in photography there seems to be no underlying reason for the slowness of the photo equipment manufacturer to adopt them for his products on the wide scale he now has.

Quoting from articles of several years ago we find writers on plastics keenly aware of the advantages which would accrue to the photo equipment industry through increased use of these materials. "It is a curious fact that molded electrical switches have been commonplace for over twenty years, while molded cameras have only within the last year and a half come into prominence. For both present exactly the same

*Durez Plastics & Chemicals, Inc.

Tiny, all-molded camera pictured at right was one of the earliest inexpensive miniature cameras. Molded by Norton Laboratories, Inc., in 1933

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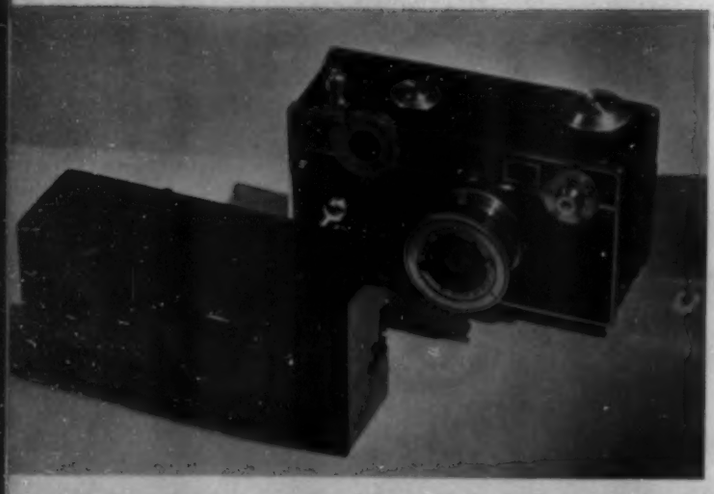

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problems to the designer and manufacturer. Both are fairly intricate jobs which combine molding with metal inserts. Both require long wearing, highly finished outer surfaces. Both require strength to resist impacts and stresses. Both are essentially mass production items. Yet, in the case of electrical switches—largely because of the one added factor of insulation—molding was readily and speedily accepted. In the case of the camera, where molding offered numerous advantages but no single dominant one to compare with insulating qualities, progress has long been retarded."

Another writer said: "Back in the days when Pearl White was being featured in serials and Francis X. Bushman was the movie matinee idol, the first all-molded motion picture camera was introduced. Companies were just beginning to send their stars and crews 'out on location.' This meant changes in climatic conditions, and sometimes these extremes in temperature and humidity would have considerable effect on equipment, particularly cameras. Previous to this, motion picture cameras had been made of metal or wood. They were costly instruments, and when the case cracked, or the metal sides expanded or contracted, it meant not only spoilage of the film, but expensive repair work. The introduction of the molded case created a great deal of interest in the industry at the time, and was the forerunner of molded camera cases of all kinds." So it appeared that while the material was ready and suitable for the purpose, the will to use it was lacking.

Visualizing this vast, untouched market, equipment manufacturers' engineers and the phenolic plastic manufacturers' chemists extended themselves to assure the development of a plastic material that would completely satisfy every requirement of camera manu-

This Falcon camera **2** *was new in 1936; the 1939 Press-Flash model* **4** *takes pictures day or night, in any light. Compact case for camera and bulb was molded by Watertown Mfg. Co. Popular price as well as popular appeal stimulated sales of the Argus plastic candid camera* **3**, *produced in 1938. Case was molded and faced with leatherette. The new all-plastic Namco midget* **5**, *is molded in three sections by Midwest Molding & Mfg. Co. Corners are rounded and the view finder extends through, inside the case*

5

facture. Their research developed the fact that a special plastic must be formulated—one which would not cause the slightest film fogging when undeveloped negatives remain in the camera for any period of time. Such a material was designed by one of the manufacturers of phenolics and was the first of its type ever produced. This development, incidentally, is another of the ever-increasing services the plastics industry is rendering manufacturers. It ranks well up in the list of such special materials as those for the rayon industry, for automatic sprinklers, for telephones, for cosmetic jars, lighting equipment, etc.

In the fall of 1932 Clayton L. Drew invented a compact movie film developing tank and reel of molded plastics. The material used was a specially formulated phenolic which entirely eliminated the possibility of chemical fog—the major problem to be met by plastics in film work. That the molding of this unit actually reduced the weight of the originally designed piece by more than three pounds was, while incidental, extremely noteworthy.

To the amateur photographer as well as the custom molder and plastic material manufacturer, the event of greatest importance and the one which had the greatest bearing on today's developments was the announcement of an all-molded plastic miniature camera in 1933 (Fig. 1). But the oddest feature of this announcement came in the mention of its price—fifty cents. Publicity at the time ran something like this—"The *peewee* camera comes to America. Made possible by a new development in a phenolic plastic, this midget picture-taker does all that bigger cameras will do, yet retails for only fifty cents. Weighs but a couple of ounces, measures only three inches high, takes six sharp snapshots on Eastman vestpocket film. Made

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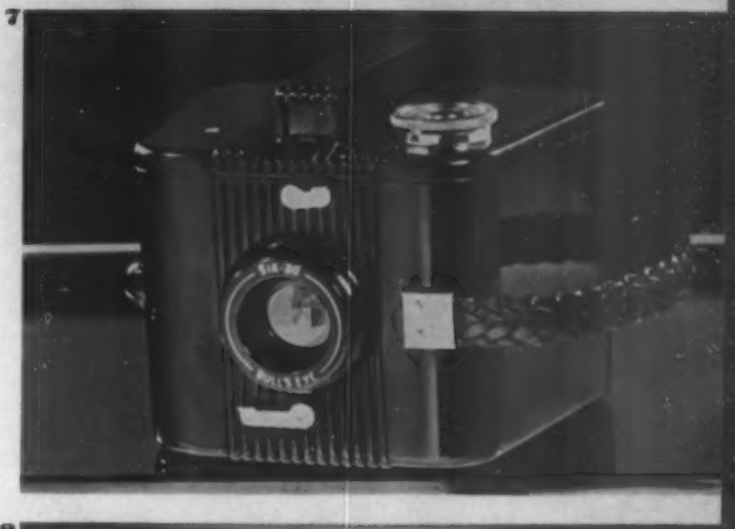

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These efficient, handsome additions to Eastman Kodak Co.'s line are typical of the many cameras and auxiliary equipment produced by the company in which plastics are used extensively. The small slide projector* 6, *the Bull's-Eye Six-20* 7 *and Baby Brownie Special (with light-colored plastic knobs)* 8, *all have sturdy, smartly designed, smooth, precision molded cases. Fig.* 9 *pictures several Kodak 35 candid cameras for which plastics were specified for accurately fitting parts

9

by Norton Laboratories, Inc., for depression purses, the camera is decidedly not a toy." Thus came into our time the all-molded, inexpensive camera—literally opening the flood gates for a surge of molded models to follow and remain today.

Close on the heels of this announcement came another by Eastman. A unit designed by Walter Dorwin Teague was marketed by them in the eighty-five cent to a dollar range. However, even this and its predecessors were hardly suited to the requirements of the less advanced amateurs. So, in 1935 Eastman introduced a new standard size film camera of molded construction—called it the Jiffy Kokak V. P.[1] It had an automatic expanding bellows with a molded case and molded lens frame and plate. The case, molded in two halves, measured $2^1/_2$ in. by $5^1/_2$ in. by 1 in. The halves locked together by means of a metal slide. It was light-proofed by using molded-in tongues and grooves at all points of contact between the two halves. The lens frame was mounted upon a metal box. Both the molded case itself and the modern styling made possible through its use caused Eastman to give it greatest prominence in national advertising. Its wide public acceptance led to the design of other non-molded models on a closely similar pattern.

During this time a small, complete kit for young photographers was brought out. Selling for around a couple of dollars, it contained all the equipment necessary for the youthful amateur—a Norton camera, film, trays, developing and fixing solutions, printing frames, photographic paper, measuring beaker, and even an album. Camera, trays and film spool knobs were all molded.

Another major development in the latter part of 1935 was the Leica *Umino* projector,[2] a lightweight portable unit, radically different in design from the very smartly engineered *Viscomatic* unit which had been produced several years previously. These projectors were primarily a part of sales kits for visual demonstrations. They used a short footage of standard 35 mm. film, a fairly high wattage lamp, and were manually operated. An interesting story regarding the adoption of plastics for the *Umino* appeared at the time. It seemed that at first it was anticipated that the projector could be made from metal stampings or die castings, but upon continued study it was found that such construction would require too many producing, assembling and finishing operations to permit its manufacture in the desired price range. Furthermore, a metal unit would be undesirably heavy and the heat transfer from a 100-watt bulb would be too great. The company soon decided that molded plastics would be the most economical and satisfactory material for production because every one of these problems was considerably minimized. The unit cost was lower than stampings or die castings. It could be made in three sections in one molding operation. Trimming, punching, drilling, grooving, finishing were eliminated at a single step. Two types of molding material were required for the job—a high impact plastic for the base to withstand hard usage—a high heat-resistant one for the lamp housing.

The inexpensive molded plastic camera continued to make headlines and it made sales curves take an almost overnight vertical jump. Such a phenomenon was bound to have a far-reaching effect. It appealed to the purse and the eye; it stepped up film sales and the developing business; it created a vogue in design that helped modernize the entire (*Please turn to page 86*)

[1] Modern Plastics, July 1935 page 11.
[2] Modern Plastics, December 1935 Page 15.

Non-hazardous, modern safety film made from cellulose acetate, can be developed at home with minimum risk.* 10. *Fig.* 11 *pictures the Vokar, a new 1940 all-molded pocket camera which has an automatic diaphragm control to safeguard against picture failure in inexperienced hands

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11

Don't They Tickle?

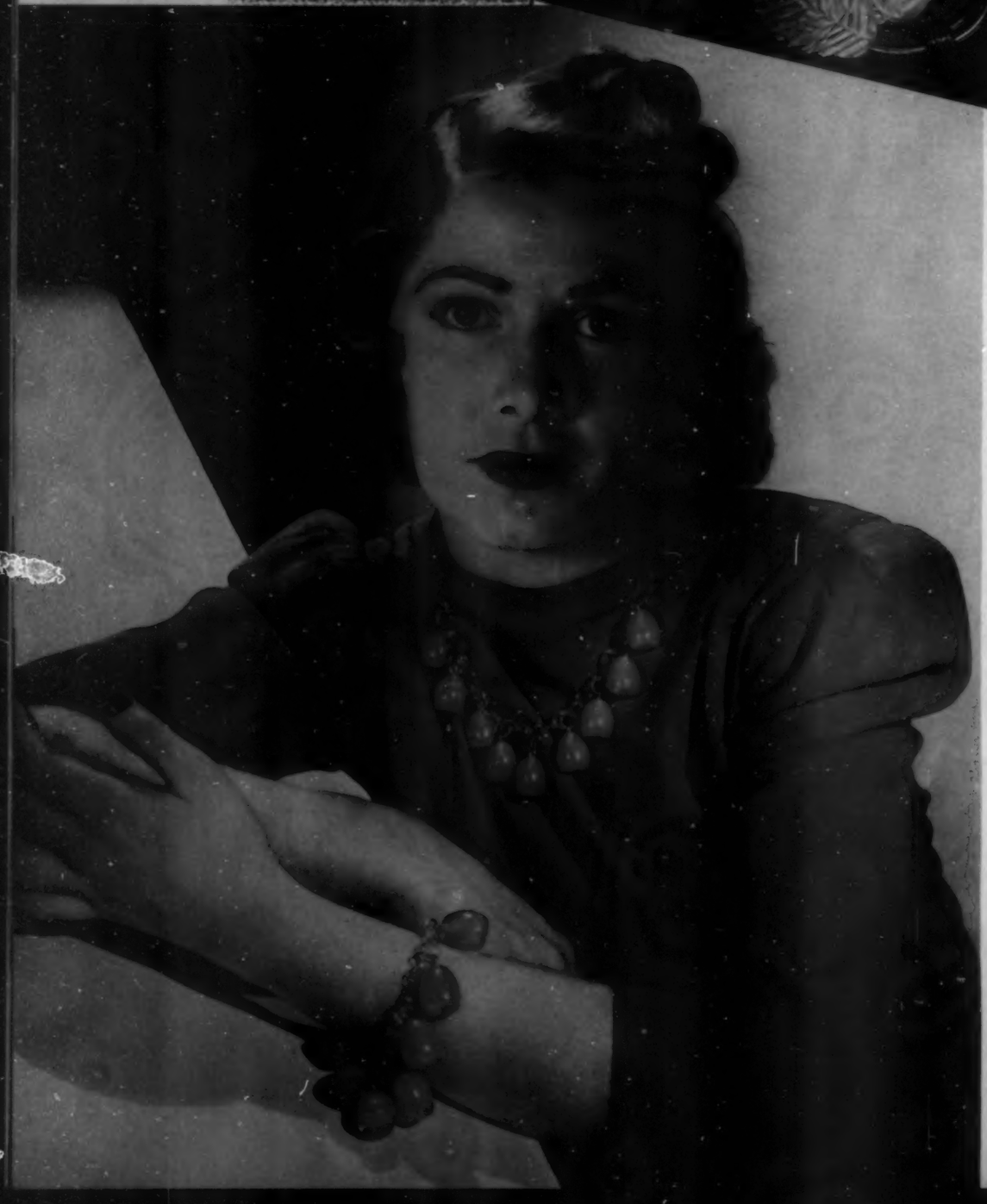
IF Salvador Dali had created this bathing suit manikin we wouldn't have been at all surprised—but he didn't. Instead, it comes (of all places) from the quaint and historic city of Philadelphia where Frederic Weinberg turned it out, using transparent acrylic sheets made in the vicinity.

Mr. Weinberg, who designs and distributes distinctive display creations, has a particular flair for plastics which distinguishes his recent contributions to the Display Manager's Art. Among them, this waterproof Venus where gold fish, swimming in *torsorial* spendor, not only attract attention—they silently but arduously, command it.

This figure was fashioned for Mr. Weinberg by Croasdale and de Angelis from two sheets of Plexiglas cemented together with a special adhesive. The gold fish are real and are very much alive

Trinket fashions

2



1

Jewelry counters these days teem wih a spring melody of trinkets for every passing fancy. Whether precious gems or clever "fakes," they impart a bit of glamour to the simplest frock. Plastics blossom forth with the best in fashionably bulky but lightweight pieces that rival nature's own hues. Worthy of special mention are: (1) Necklace and bracelet to match with "dangles"—gem-like in coloring and depth—cut from opalescent toned Monsanto cast phenolic. (Made by U. S. Plastics Corp.) (2) Parkwood, the versatile laminated woven wood veneer that has been adapted to architectural uses, suitcases, bags, belts and even boats, is equally effective cut down to jewelry size. Leaves of white birch hung on the transparent links of a plastic chain make a really delightful necklace. There's a matching bracelet with smaller leaves scattered its entire length, and a three-leaf pin with transparent plastic stem completes the set. (3) A bracelet, with gold mesh inside and a mahogany veneer strip outside, has a little gold colored flower at each end. A metal scottie on a chain ambles across a gold framed, mahogany surfaced pin, while a "lucky" elephant with trunk high in the air, stands out against a background of white birch veneer on another pin. (4) Carl Boos carves dainty floral patterns on the under side of crystal clear Plexiglas fashioned into bracelets and pins. (5) And for the purse, a cigaret case with a tricky holding arrangement for long or short cigarets or both, made of Parkwood white birch veneer.

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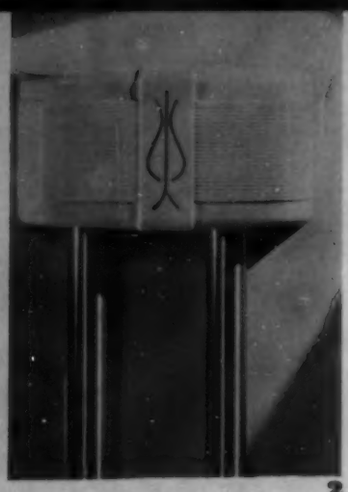

2

1 Use your favorite ink in this Adapto dip pen desk set. It holds 2 oz. bottles of various shapes and no pouring of ink is necessary. Chicago Molded Products Corp. mold the Durez base and Tenite top for Sengbusch Self-Closing Inkstand Company

2 Music from your doorbell—A. E. Rittenhouse Co. encases mellow electric door chimes in a handsome housing decorated with a musical motif. Molded by Diemolding Corp. in Plaskon pastels and black or walnut Bakelite

3

4

3 Minutes and seconds roll by on a speedometer-type dial in a smart Pennwood clock designed by Peter Müller Munk. The smoothly finished, tough housing, injection molded of Tenite II by Baldwin Laboratories, fits the metal base accurately. Colors are walnut, ivory and coral

4 Thermodex combines room thermometer, fountain pen stand and paper weight in a neat one-piece housing molded by Universal Plastics Corp., of Bakelite and Plaskon. Smooth flowing lines and colors match the Autodex automatic index made for Zephyr American Co. who distributes both

5

6

5 Stay on the right road—simply turn the Tenite knobs on this McCauley map case and study the scroll map through a transparent acetate cover. Case holds 25 ft. of map in use and stores 25 ft. more between rollers. Molding is by Thermo-Plastics, Div. of Standard Products Company

6 For that last minute appraisal in darkened corridor or car—this dainty vanity illuminates the mirror with a tiny bulb fed by a battery. Lumarith case is molded by Erie Plastics Company

7

7 To build sales for its Hombrite Cleanser, Cook Coffee Co. offers a good-looking, practical, scarlet and black container as a premium. Norton Laboratories, Inc., molds it of Durez

8 Nonchalant, urbane, Planters' familiar "Mr. Peanut" is turned out of Lumarith from top hat to toe. This amusing little fellow, molded in true peanut color by Cruver Mfg. Co. is being used for a variety of advertising premiums

8

9 A diorama of Manhattan with 28 of New York's important buildings constructed in miniature, is on display at the city's Information Bureau at Pershing Square. Buildings were built up from clear Lucite sheets, subsequently sandblasted and are periodically lighted from below. The exhibit, sponsored by the N. Y. Central R. R. was designed by Henry Dreyfus and constructed by Diorama Corp. of America

plastics in review

10 From England comes the "Dap-Runesy," a noiseless non-corrosive, flexible curtain rail made from extruded phenolic resin. Sections can be built into window frames or attached with brackets and are equipped with sliding plastic rollers and end-stop. Rods can be produced in lengths up to 15 feet, in various colors and can be bent to the requisite shape

11 Transforming white light beams into a strong orange tint that cuts through fog, Auto Fog Caps improve visibility and reduce glare. These clear shells, made of Monsanto cellulose acetate fit over headlights, attached with elastic bands, and are weather-proof

12 Bathtub fleet of tiny sailboats in bright mottled effects are scientifically designed to travel at a "fast clip." Molded of Monsanto cellulose acetate by Zenith Plastics, Incorporated

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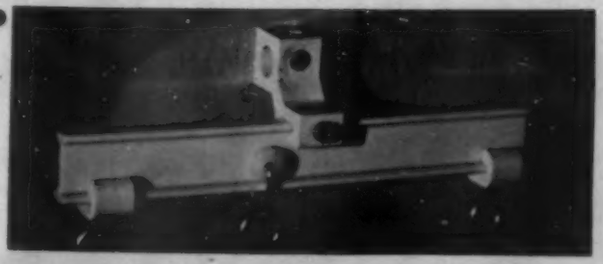

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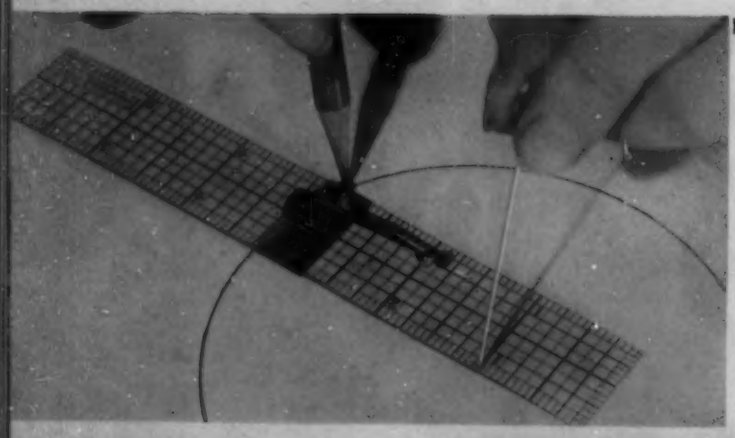
plastics in review

13 Used as a compass or ruler, this handy six-inch plastic Transparule allows the draftsman a clear view of the working area. Sillcocks Miller Co. fabricate these for the Transparent Ruler Company

14 All plastic window sills, strong, durable and permanent in color and finish, have been selected by Edward G. Budd Mfg. Co. for new, lightweight streamlined railway cars. Both top and under side of these solid blocks of Monsanto cast phenolic are pictured

15 Strobobeam, an assembly of Neon lamp and extension leads for connection between engine distributor and spark plugs, tests ignition timing on the principle of light synchronized with motion. Nine-inch housing is of yellow Durez, molded by Midwest Molding & Mfg. Co. for the Bendix Radio Corp.'s line of auto equipment

16 An itinerant exhibit—compact, economical, lightweight, easily handled—makes an attractive pre-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sentation at trade shows and conventions all over the country. Designed by Robert P. Murray for American Can Co., it was built by The Displayers. Edge-lighted letters of Monsanto fluorescent acetate project from a natural wood grain background, and also illuminate change-able photographs through translucent Lamicoid in the recessed panel. Trans-parent bent shelves are of $^3/_8$-in. Plexiglas sheet. The base is of yellow Formica

17 Weight reduction and contrast in the design of Pelton & Crane Co.'s sterilizer are achieved by the use of a molded cover. Plastic feet protect table tops. Phenolic handles minimize heat transfer and all three are from the same mold. Peerless Molded Plastics, Inc., mold plastic parts of Durez

18 A three-step display brings bottles of varying height more nearly into line. It has a molded-in classic design, white wiped-in lettering. Triangular recesses are molded in as sockets to fit the glass containers. Auburn Button Works, Inc., mold the stand of Bakelite for Norwich Pharmacal Company

19 Number Please—Tiny facsimiles of license or social security numbers identify key rings in case of loss. These ingenious little plaques are made of Lumarith by Minatur-ettes, Incorporated

20 Hand-painted place mats in divert-ing patterns and nursery rhyme scenes delight children, and their easy-to-clean surfaces please mothers, too. Mats for small play tables, or cut to fit high-chair trays, are made from Plastacele sheet by Jane Ross Studios.

21 Laboratory model Webcell Con-tinuous Dialyzer of transparent Lucite is an ideal unit for experi-mental work in the recovery of soluble salts or purification of solutions. Opera-tion can be observed through the clear plastic model, which bears a direct capac-ity relation to the production machine. Made by Brosites Machine Company

22 Utility boxes of rich black Tenite are attractive handy accessories for dresser or traveling bag. Injec-tion molded by Universal Plastics Corp. and inlayed by Plastic Inlays, Incorporated

23 Lost in the dark? Viz. flashlight will help you find it. Electric power is generated by simply pressing the finger-tip grip. Housing is produced of non-corrodible Bakelite and Durez by Molded Insulation Company

24 Tough, attractive bindings for advertising books and catalogs are made by Plastic Binding Corp. in colors to match or contrast with covers. Backbones are cut from Vinylite sheet, formed to shape and names imprinted

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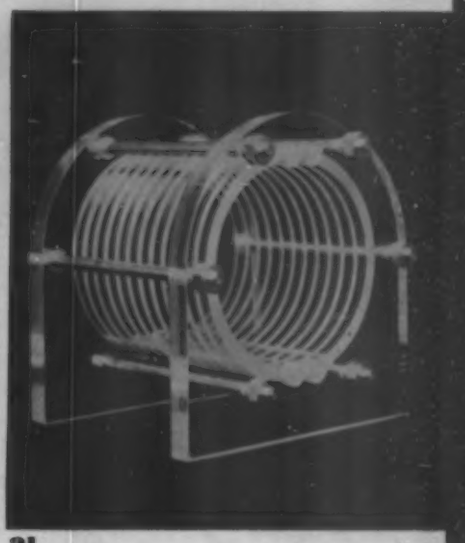

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CASH IN on consumer inability to resist the appeal of vibrant, sparkling color!

Dress up your products with PLASKON Molded Color. Make them irresistible to the eye and hand . . . make them a *"must have"* to the prospect's desire!

Leading national merchandisers are now utilizing PLASKON Molded Color as an effective selling aid, both in product manufacture and as a packaging or display material. The photos on the opposite page show how Gruen Watch display cases (top) and Mary Chess toilet goods containers (bottom) are enhanced with PLASKON Molded Color.

These units received top awards in the 1939 All-America Package Competition, as outstanding examples of well-displayed products with excellent sales appeal!

Have you considered *all* the advantages Molded Plaskon can give *your* product?

Packaged with PLASKON

Molded Plaskon is smooth and warm to the touch. Though light in weight, it has great strength—will not chip, corrode, rust or tarnish. Its surface is hard, easy to keep clean. Water, oils and organic solvents will not stain or otherwise affect the beauty of Molded Plaskon. Being solid, molded color, the finish is permanent. Neither scratching or abrasion impair its color value.

These are but a few of the many distinctive qualities that have made Plaskon the world's largest selling urea-formaldehyde plastic—and one of the most versatile.

An experienced Plaskon representative will give you recommendations for adapting Plaskon to your manufacturing and product-development needs. Write or wire—no obligation!

2121 SYLVAN AVE. **PLASKON COMPANY** Incorporated TOLEDO, OHIO

Canadian Agent: Canadian Industries, Ltd., Montreal, P. Q.

Trade Mark Registered

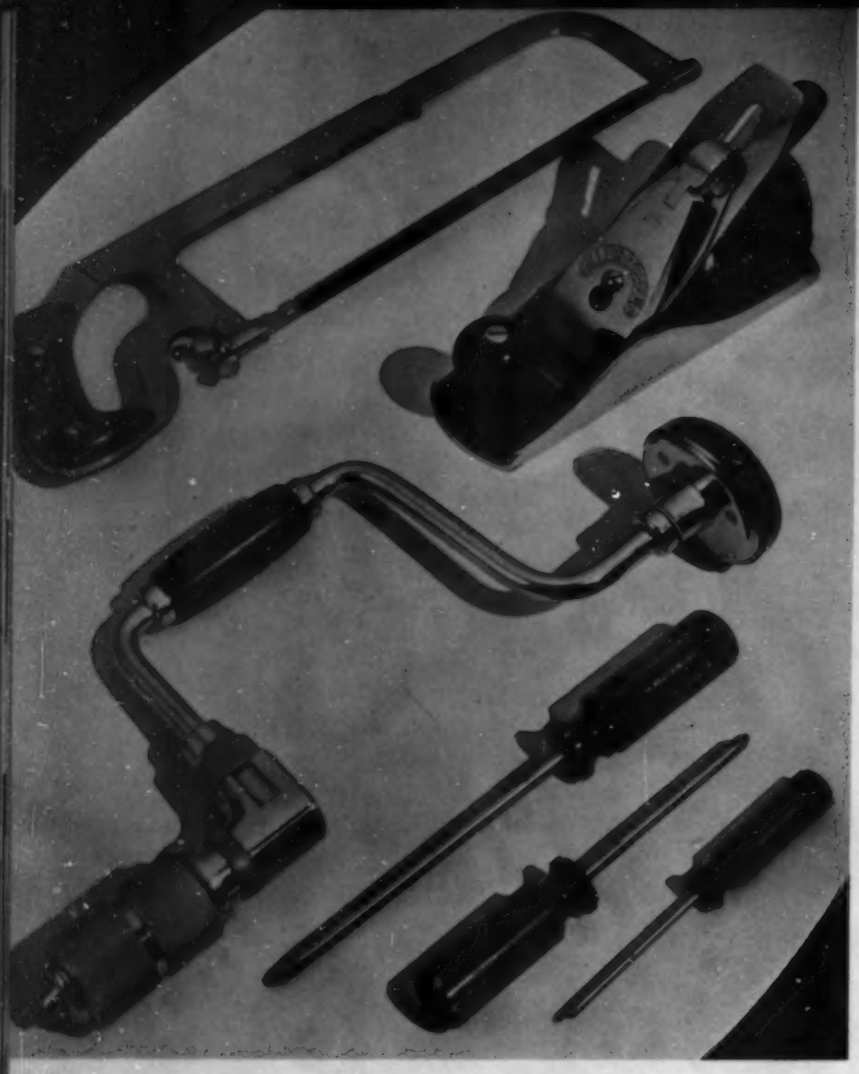
PLASKON

★ MOLDED COLOR ★

This is the prize-winning PLASKON Molded Color display case used by the Gruen Watch Co., Cincinnati, Ohio, for its ultra-modern Curvex Wrist Watch. The case is molded by the Rathbun Molding Corporation, Salamanca, N. Y.

..eye catching.. sales-making!

These are the prize-winning Mary Chess products utilizing PLASKON Molded Color for containers, and vial and bottle tops. These units were molded for the Mary Chess Company, New York City, by the Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn.



Handles on these Millers Falls Co. tools for home craftsmen, are fashioned from brilliant red transparent cellulose nitrate. Dealers are particularly cooperative in presenting them because they make a colorful display

Good tools made better

De luxe products created solely to meet a fastidious demand

WE dropped in to chat with a friend of ours the other day. "You'll find him out in the shop," his wife told us. The "shop," a one-story frame building near the garage, wasn't much larger than a good-sized hen-coop and as we walked over to it we could hear the buzz of a power saw slicing through wood. We knocked. No response. The whirring and buzzing was louder than ever. So we opened the door and walked into one of the most compact and best equipped workshops we have ever seen outside of a professional establishment. Our friend, a printer by trade, was "relaxing" by constructing a bird house to be ready for tenants come spring.

We were amazed at the completeness and efficiency of the small shop. Across the end was a bench built to just the proper height and width to make for comfortable working. Shallow drawers, clearly labeled, were stacked neatly in a corner, each with a generous supply of nails or screws, one size to a drawer. Underneath the bench was a series of deeper drawers—one with a collection of screw drivers from the tiniest specimen to the huskiest, man-sized type; another with drills of all sizes, and others for planes, small hand saws and a raft of similar gadgets. It was quite evident, even to our inexperienced eye, that there wasn't anything hit-or-miss about the selection of these tools. Each set matched or harmonized with the other most pleasingly.

According to tool makers, there are thousands of such home workshops. They are not all as elaborate as that of our friend. Some may be tucked away in the basement or a corner of (*Please turn to page 94*)

Stock Molds

SHEET NINETY-FOUR

These practical household items in bright colors, suitable for souvenirs or advertising premiums, are available from stock molds without mold cost. Address Stock Mold Department, Modern Plastics, Chanin Building, New York, for manufacturers' names and addresses

---

1157. Ivory utility bowl, 10 3/8 in. overall diameter. Molded feet, 1 in. high. Overall height 3 in. Inside depth 2 in. In black also

1170. Ash tray with five molded rests for smokes. Overall diameter 5 3/4 in. Inside diameter 4 3/8 in. Overall height 3/4 inch

1171. Decorative frame for photos, calendars, menus, etc. Overall dimensions 6 3/8 in. long by 1 5/8 in. wide by 3 1/8 in. high. Inside, 4 in. wide by 2 3/8 in. high with 3/8 in. groove for inserting photo

1172. Rectangular frame, 4 7/8 in. by 3 1/8 in. overall. Inside dimensions 4 1/8 in. by 2 3/8 in. 3/16 in. grooved back for inserting photo, display card, etc.

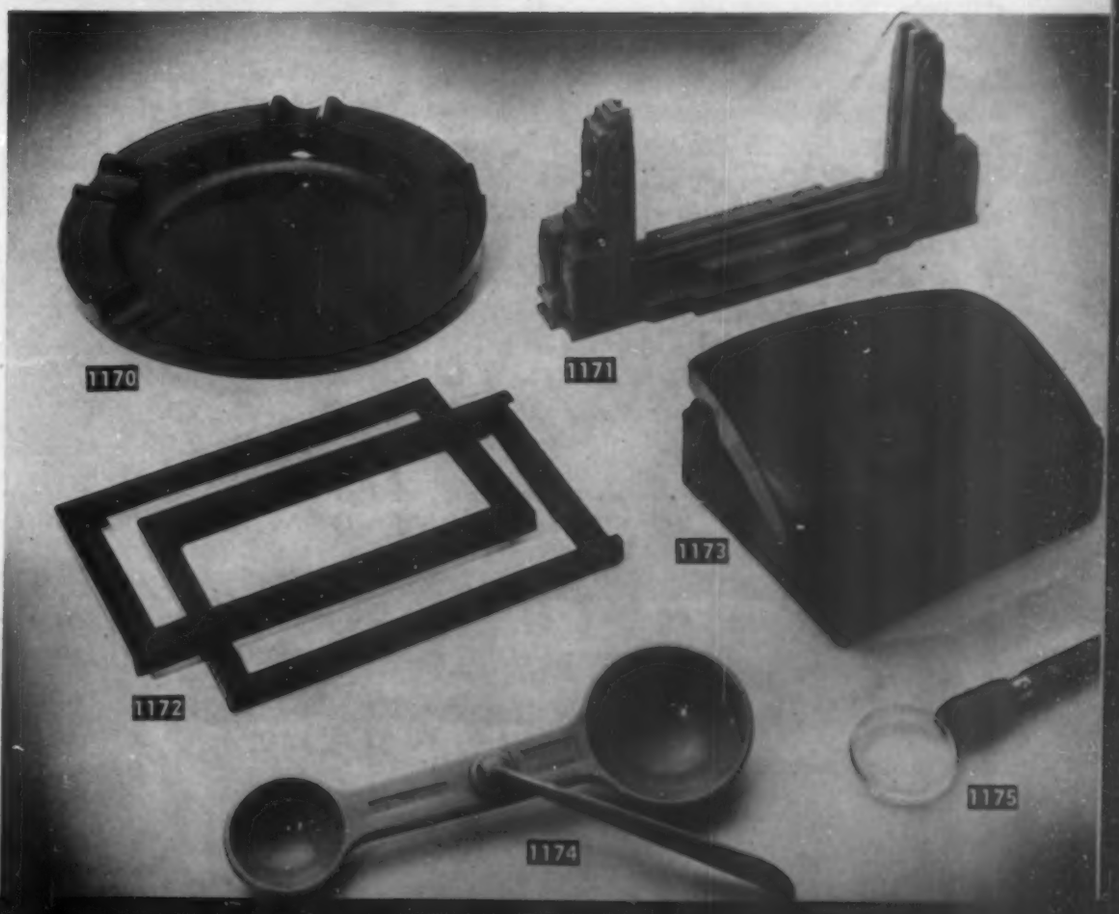
1173. Cigaret box with separate cover. Overall dimensions 3 7/8 in. by 3 1/8 in. by 1 13/16 in. high. Inside depth 1 3/16 in. Cover 1/2 in. high at rounded center

1174. Combined tea- and tablespoon dry measure, with 3 1/4 in. swinging leveler. Overall length 5 5/8 in. Diameter at small end 1 1/4 in.; at large end 1 13/16 inches

1175. Magnifier attached to slip-on rubber pencil cap. Diameter 1 1/8 in.; 3/16 in. thick. Magnifying strength, 2 1/2 times

All molders are invited to submit samples from stock molds to appear on this page as space permits.

Reprints of Sheets One to Fifty-two available in book form, Twenty-five cents in coin or stamps



RESINS WITH A RECORD ...for finishes with a future

ALUMINUM PAINT for city truck fleet maintenance must show great wear and weather resistance—and it does when formulated with Durez resins!

GASOLINE PUMPS also take a beating from the elements—plus gasoline, grease, oil, etc. But finishes made with Durez resins offer sure protection.

DUREZ RESINS have long enjoyed an enviable record in the automotive industry for producing black fender dipping enamels that really can "take it."

DUREZ RESINS are used with great success and economy in shop coats for steel work. These finishes also have many outdoor metal applications.

SHOWN HERE are some of the applications of industrial finishes made with Durez 100% phenolic resins. They represent but a handful of the many types of industrial paints and primers that are being made tougher and more durable—and often at lower cost—with Durez oil soluble resins. The list is "as long as your arm"—and growing all the time!

No matter what kind of industrial surface protection is wanted, you'll find that formulations made with one or more Durez resins will give your product the desired qualities—with something to spare! And you'll also find exactly the *type* of Durez resin you need to impart these qualities. Write for information and suggestions.

DUREZ PLASTICS & CHEMICALS, INC.
554 WALCK ROAD NORTH TONAWANDA, N. Y.

WHITE FINISHES for auto number plates must have great durability and flexibility. Durez resins impart both of these qualities plus lasting whiteness.

DUREZ PLASTICS & CHEMICALS, INC.

PLASTICS THAT FIT THE JOB

Looking at patents on molding

by JULIAN F. SMITH

THE refinements of modern molding, achieved by many minds campaigning on many fronts, are minutely disclosed and described in numerous United States patents. Revolt against what one inventor termed "brute force methods" is responsible for many improvements in molding presses, while others were introduced to meet special requirements or to utilize the characteristic properties of new plastics.

The state of the art is reviewed here chiefly to show the development of automatic molding presses in the interests of modern mass production. Some attention is also given, however, to those parallel advances which have kept extrusion, injection molding and other methods abreast of the times. This review is not a complete survey but is necessarily limited to a few patents, selected as illustrative of the advances which have brought molding practice to its present state.

A. Forming shaped articles in mold presses.

I. Transfer pressure molding.

John S. Stokes and his associates sought to overcome the defects inherent in both types of mold then in use, namely, positive die molds and the open or flash type, with their inaccuracies and uncertainties under high, inadequately controlled mechanical stresses. Their improvements brought the transfer pressure type of molding machine to a high state of development, permitting enormous pressures to be exerted without the damaging surges which frequently occurred in positive die molds.

This molding process is particularly applicable to reactive thermosetting resins. Pressure is applied to the plastic, not directly in the mold cavity but through a separate pressure chamber. As much as 100,000 lb. per sq. in. may be applied, but pressures between 5000 and 60,000 lb. per sq. in. generally suffice. Under such pressures a normally stiff plastic will flow like water and the pressure chamber is almost instantly emptied into the mold cavity. The operation generates considerable heat, but the velocity is so great that precuring is avoided.

Four embodiments of the transfer pressure principle have been selected to illustrate its utility and its contribution to the art. They are disclosed in patents assigned to John S. Stokes.

U. S. P. 1,916,495, July 4, 1933, Louis E. Shaw. By taking advantage of the plastic material itself as a medium for transmitting hydrostatic pressure to the mold cavity from a separate pressure chamber this invention permits the use of softer metals in molds, instead of the expensive hardened steel formerly required. Indeed, some operations even permit the use of nonmetalic molds, made from still cheaper materials.

A number of mold cavities, in horizontal or vertical arrangement, can be supplied from a pressure chamber. Very narrow-passages from pressure chamber to mold cavity allow for heating the plastic much or little, as may be required under the circumstances of each molding operation. Several passages may lead to a single cavity if preferred. For small moldings the cross sectional area of passages may be as little as 0.003 sq. in. While wider passages are permissible for larger moldings they should always be narrow enough to permit thorough heating.

Mechanically, a molding machine using the transfer pressure principle consists essentially of a mold cavity (closed except for the inlet orifice, to avoid fins), a pressure chamber with adequate capacity to fill all mold cavities to which it is connected, and a close-fitting plunger which forces the plastic from the pressure chamber into the mold cavities. These operating parts are suitably mounted in a platen press, with means for actuating the plunger and for ejecting the molded articles from the mold cavities.

U. S. P. 1,919,534, July 25, 1933, Louis E. Shaw. While the preceding patent (U. S. P. 1,916,495) discloses the transfer pressure principle and describes the apparatus, its claims cover only the process. The present patent (U. S. P. 1,919,534) specifically claims the apparatus employed in transfer pressure molding.

U. S. P. 1,993,942, March 12, 1935, Emil E. Novotny. As a further advance in the method, this invention contributes improvements in temperature control and discloses the necessary mechanical means for automatic repetition of the operation as long as the supply of plastic is replenished. Molds for the transfer pressure method cost only about a third as much as for the older methods, and require less maintenance expense. By means of suitable valve arrangements the new machine keeps the plastic hot enough to retain its plasticity,

feeds the required amount into the mold cavities, effects thermosetting, ejects the molded pieces and cleans the mold cavities.

Circulating steam supplies heat for maintaining the material in a plastic state and for heating it to the setting temperature. To this end the pressure chamber is held at an elevated but moderate temperature while the mold is heated hotter. The temperature control is so arranged that the narrow passages between pressure chamber and mold cavities have two different temperature zones, one corresponding to the moderate heat in the pressure chamber and the other to the higher heat in the mold and mold cavity, as set forth in the claims.

U. S. P. 1,997,074, April 9, 1935, Emil E. Novotny. This invention, while utilizing the same principle, improves on the preceding patents by taking advantage of the allowable superpressure to utilize cheap plastics which are too slow-flowing for ordinary molding operations. Similarly, cheap fibrous fillers such as shredded canvas or paper are forced to flow under superpressure so that they exactly reproduce the contour of the mold cavity and retain little or no visible trace of their fibrous structure. This embodiment of transfer pressure molding is particularly useful for making laminated sheet products, mechanical articles such as silent gears, and such moldings as automobile steering wheels. The patent also discloses and claims an improvement which is important when superpressures are applied in the pressure chamber, namely, automatic release of excess pressure from the mold cavities. This is accomplished by providing for rapid opening and closing of the mold cavity when a designated pressure is exceeded therein.

II. Automatic operation.

1. *Pressure controlled devices.*

The idea of utilizing pressure, already serving other functions in the molding machine, to control some part of the molding operation has been employed by several inventors. A few inventions of this type have been selected for review.

U. S. P. 1,880,874, October 4, 1932, Jasper Derry (assignor to Andrew Terkelsen). A pressure-actuated electrical control device for automatically controlling the closing movement of the press, and maintaining the predetermined pressure after the press has stopped, is provided for mechanically operated molding presses. As set forth in the principal claim, the two press elements are brought together or moved apart by an electrically operated rack and gear train; one of the press elements carries a spring, governed by the pressure exerted on the press and arranged to stop the motor (and hence the closing of the press) when a predetermined pressure is reached.

U. S. P. 1,881,232, October 4, 1932, Franz Kurath (assignor to Economy Fuse and Mfg. Co.). Neither the flash type nor the positive type mold is satisfactory for certain shapes, such as deep hollow articles with exterior threads or bosses. The improvement claimed in this invention is a mold comprising a pair of mold blocks, mounted in cooperating relation by toggle links on a fixed frame in such a way that pressure on the plunger in the interior of the molded article also serves to bring the mold blocks together in closed position.

U. S. P. 2,124,733, July 26, 1938, Hugh L. Decker (assignor to Electric Auto-Lite Co.). In molding operations requiring the use of side cores in the compression chamber the resulting projections must move in and out of the compression chamber in timed relation with the movements of the piston, to avoid forming undercuts in the molded articles. This invention provides automatic means for accurately timed motion of the side cores. The improvement defined in the claims comprises a piston device for moving the side cores in and out in response to an actuating force differential created by a high pressure (exerted near the closed mold position) acting on a small area and a varying pressure acting on a larger area, the motion of the side cores being effected by the bucking force of the varying pressure derived from the fluid pressure which operates the plastic molding press.

2. *Controlling pressure.*

Conversely to the use of pressure for controlling molding machine operations, due attention must be given to controlling the pressure itself. An invention which contributes especially to this phase of the molding art is the following:

U. S. P. 2,095,299, October 12, 1937, H. D. Thweatt and Otto Hoffmann (assignors to Lake Erie Engineering Corp.). This invention relates to an automatic molding machine in which the mold is operated by a lifting ram and a pair of pull-back rams. Through a suitable arrangement of valves, controlling and directing the actuating fluid pressure, the lifting ram is kept under low pressure during the main part of its upward movement but a high pressure is applied at the end of the lift for a sufficient time to exert the required compacting force on the plastic in the mold. The pull-back rams, on the other hand, are kept constantly under a high pressure but because of their relatively much smaller area they are ineffective against the force exerted on the lifting ram and become operative only when the pressure is cut off from the lifting ram. A valve and tappet arrangement for automatically applying and controlling these different pressures is a feature of the claims made in the patent.

3. *Mold operating mechanisms.*

Automatic devices for positioning molds in a press and for opening and closing molds at the correct time are prime essentials which have received much study. Progress in this direction is illustrated by the following examples:

U. S. P. 1,959,612, May 22, 1934, Jas. P. Burke (assignor to Auto-Mold, Inc.). This invention relates to a machine in which the pressure on the plastic is applied in successive increments, not by a gradual increase. This gives opportunity for gases to escape and

also gives a compacting effect very similar to that obtained by tamping. According to the claims these effects are achieved by a series of traveling dies, each die having a rotary device to keep it in the open or closed position or under compression, and a series of rotary power units stationed along the path traversed by the dies so that each power unit acts successively on the passing dies. The dies are mounted on an endless carrier so the machine may operate continuously.

U. S. P. 1,992,314, February 26, 1935, H. P. L. Laussucq (assignor to Birdsboro Steel Foundry and Machine Co.). Because the operations of filling, discharging, cleaning and inspecting molds while the dies are in registry position introduces difficulties and calls for complicated mechanical devices a new setup is disclosed and claimed in which the press surfaces of both dies are made accessible between molding operations. To this end an automatic control system is provided which starts the press as soon as the dies return to registry position but makes starting impossible while the dies are out of this position. The necessity of reaching between the dies to fill, discharge or clean them has been responsible for many accidents to press operators. This hazard is now eliminated. The mechanical improvement claimed under this invention comprises upper and lower dies which are movable not only about a horizontal axis but also laterally, the upper die carrying rams in alignment with the lower die for clamping the mold inserts in place in the molds; means are provided for shifting the dies out of registry while said means are in interlocking connection with a stripper mechanism so that the stripper cannot operate while the dies are in registry and under pressure.

U. S. P. 2,141,195, December 27, 1938, F. A. Novak and H. B. Harn (assignors to Molding Service, Inc.). In a molding press which is particularly adapted to the semicontinuous fabrication of small parts such as molded screw caps the press platens carry a series of mold-plates, while the corresponding mold plates are mounted on a rotating drum interposed between the platens. With each successive partial revolution of the drum one series of mold plates is brought into registry with the corresponding plates on the platens, for molding a series of caps, while another series is brought out of the molding position and into position for discharging and cleaning. An automatic ejector unscrews the molded caps and discharges them.

4. *Feed devices.*

U. S. P. 1,982,576, November 27, 1934, Jasper Derry (assignor to Andrew Terkelsen). An improved mechanism for feeding molding powder to the molds in making articles from phenolic or like resins provides a relatively large feed box, the reciprocating motion of which permits uniform heating of the powder prior to molding and so prevents agglomeration of the powder before it enters the mold. Claim 1 of this patent reads: "In a press for hot synthetic molding, in combination with the die having a plurality of relatively isolated mold cavities therein, a feed box having a permanently open bottom opposing said cavities collectively and of a capacity to contain a volume of powder sufficient for repeated charges for said cavities, a table lateral to the die, means for preheating the table, and means to move said box from and to the table over and from said die."

U. S. P. 2,054,476, September 15, 1936, Jasper Derry and Edwin A. Terkelsen (assignors to Terkelsen Machine Co.). This patent claims improvements over the prior art both in feed mechanism and in the ejector of a molding press. A particular advantage is that pressure is applied to the plastic material in two stages and that the application of pressure after the initial compression stage is gradual. To impart this follow-up pressure suddenly has undesirable consequences which are now prevented. The improved feed device, designed to operate in conformity with this pressure system, comprises an open-end hopper, a slide having pockets and moving horizontally under the open end of the hopper, and means for filling the pockets from the hopper. The improved ejector comprises a device for forcing the molded pieces from the molds as they open, with a swinging chute which carries the pieces from the mold and is tiltable for discharging the pieces.

5. *Two-station molding presses.*

The design and operation of two-station hydraulic presses have been improved mainly in the direction of simplifying the movement of plastic material from one station to the next, and ejection of molded shapes.

U. S. P. 1,871,406, August 9, 1932, J. A. De Turk and E. D. Hanson (assignors to Western Electric Co.). The mold press claimed in this patent has a tiltable head with latches for attaching the upper mold section thereto, an ejector plate which simultaneously ejects the molded pieces, and a manually controlled release lever which can be operated only when the tiltable head is parallel with a vertically movable head at the sub-pressing station.

U. S. P. 1,874,698, August 30, 1932, J. A. De Turk (assignor to Western Electric Co.). This invention is particularly intended to permit high speed molding with a minimum of attention and supervision. Pressure is applied in three stages, namely, about 500 lb. per sq. in. for 1 to 3 minutes in the initial heating stage, then about 2000 lb. per sq. in. for 3 to 10 minutes while heating, and a still higher pressure while cooling. Claim 1 reads: "In a molding machine, a mold comprising a plurality of molding members, heating means, and means for displacing one of said molding members relative to the other and place it in contact with said heating means."

U.S.P. 1,904,239, April 18, 1933, F. V. Johnson, E. D. Hanson and D. V. Waters (assignors to Western Electric Co.). This invention provides a press having heated platens at the main pressing station and cooled platens at the sub-pressing station. The ejector, actuated by a ram after opening the molds at the sub-pressing station, can operate only when in a predetermined position with respect to the ram, and the sequence of operations is under mechanical control (*Please turn to page 96*)

Experimentally molded from a new type cellulose acetate, coaster set (left), comb and salad servers (right) have improved resistance to water and heat

Plastics from cellulose acetate of higher acetylation

by WALTER E. GLOOR*

IN THE last decade, cellulose acetate has rapidly grown as a base for plastics. In injection molding, in particular, it has been especially useful, enabling molders to produce large units of high quality and good physical characteristics. With the development of injection molding, cellulose acetate plastics expanded into wider fields and encountered more varied conditions. This created a need for a material to withstand more severe exposure to heat and moisture than could be met by plastics based on regular cellulose acetate of 52 percent to 54 percent combined acetic acid.

By acetylating cellulose to a greater degree, its water-sensitivity may be reduced. On this fact, a program was undertaken to determine whether the water resistance and heat resistance sought could be obtained through the use of a cellulose acetate of higher acetic content than that normally incorporated into plastics. It was found that plastics could be made from a cellulose acetate of 57 percent to 58 percent combined acetic acid by the usual methods of handling cellulose acetate, and that the properties of this material offered promise of real improvement over the conventional acetate materials with respect to their resistance to water and heat.

Data relating to the properties of plastics based on *W*-type cellulose acetate (58 percent acetic acid), typical cellulose acetate (52 percent to 54 percent acetic acid), and cellulose acetate butyrate molding powders are presented in Table 1. The methods of test are roughly outlined in footnotes to Table 1; these tests are similar to those used generally in the trade.

The table is based on materials of similar flow designations, in order to provide a standard basis for comparison. It is seen that satisfactory physical properties can be obtained with the 58 percent acetic material, hereafter designated as *W*-type acetate, although for an equivalent flow the hardness and stiffness of this kind of plastic might be lower than that of the corresponding regular acetate or mixed ester molded piece.

The numerical values for water absorption on immersion do not show quite all the improvement in this property to be obtained by the use of *W*-type cellulose acetate over the conventional type. In addition to the fact that the former shows 10 percent to 30 percent less water absorption than the latter, the tests on immersion in hot or boiling water show that the *W*-type plastics exhibit much less surface marking and warping than the conventional cellulose acetate moldings under such conditions. Molded pieces based on *W*-type may be dipped in boiling water with little or no warpage and no effect on surface gloss or odor, if made sufficiently hard.

It is recognized that molding conditions play a real part in determining the quality of a particular molding, and plastics based on *W*-type acetate are no exception to this. To obtain best physical properties, it should be injected at a rather high temperature. Since the material is not critical to mold, as indicated by the fact that a formula such as *W*-type plastic "A" gave good pieces from 390 deg. F. to 440 deg. F. on the same

* Hercules Powder Co.

TABLE 1. PHYSICAL PROPERTIES OF CERTAIN CELLULOSE PLASTICS

Formula No.	Flow Temp., Deg. F.	Flow Rating Mfr. A	Flow Rating Mfr. B	mpact[1]	Hard-ness[2]	Modulus of Elasticity[3]	Flexural Strength[4]	Percent Water Absorption 48 hr.	Percent Water Absorption 96 hr.[5]	Warp Test Gain 120 hr.	Warp Test Defl.[6] (5 days)	Appearance	Resistance to Hot Water[7] 1 Minute in Boiling Water	Resistance to Hot Water[7] 20 Minutes in Water at 70–80 deg. C.
Regular Cellulose Acetate (52–54 Percent Acetic Acid)														
Commercial Plastic No. 1	...	H-4	H-3	0.9	53	389000	11400	1.08	1.62	6.5	3/32	Surface fair	Severe etch, gloss poor	1/4 in. warp, surface dull & etched
Commercial Plastic No. 2	...	S-1	MS	4.6	13	252000	7200	1.00	1.44	5.7	1/32	Surface fair	Sl. etch, gloss fair, warped	5/8 in. warp, surface etched
Commercial Plastic No. 3	...	M	M	6.0	20	234000	6300	1.38	2.18	4.5	3/64	Surface whitens	Warped, etched	
Commercial Plastic No. 4 (welding grade)	...	M	M	5.9	24	221000	5725	1.03	1.54	2.7	9/64	Surface fair	Sl. warp, whitened	3/4 in. warp, surface whitened
Commercial Plastic No. 5	...	M	M	7.1	22	251000	5310	0.80	1.11	2.8	1/8	Surface etched & crystallized	Severe warp & whitening	11/16 in. warp, surface whitened
W-Type Cellulose Acetate (57.5–58.2 Percent Acetic Acid)														
W-Type Plastic "A"	300	H-1	MH	2.5	32	305000	9120	0.71	1.05	3.1	1/8	Slight etch	Slight warp, gloss OK	1/8 in. warp, slight etch
W-Type Plastic "B"	305	H-2	H	3.2	37	305000	8750	0.69	0.98	2.8	1/32	Surface OK	Slight warp, gloss OK	1/16 in. warp, slight etch
W-Type Plastic "C"	316	H-3	H-2	2.8	38	299000	8920	0.98	1.32	4.5	1/64	Slight etch	No effect	1/16 in. warp, slight etch
W-Type Plastic "D"	292	M	M	7.2	15	206000	6250	1.16	1.69	1.01	1/64	Sl. whitening	No warp, slight etch	5/16 in. warp, surface slightly etched
W-Type Plastic "E"	297	M	MH	3.3	−2[3]	181000	6060	0.93	1.37	0.99	0	Slight sweat	No warp, slight etch	No warp, surface slightly etched
Cellulose Acetate-Butyrate (Plastics Grade)														
Commercial Plastic No. 6	...	H-1	H	1.2	58	300000	11100	0.84	1.12	2.2	1/64	Surface OK	Slight etching	No warp, slight etch
Commercial Plastic No. 7	...	M	M	6.5	33	254000	7850	0.65	0.94	1.79	0	Surface OK	No effect	1/16 in. warp, no blemish
Lab. Plastic No. 1	297	M	MH	1.6	54	260000	8350	0.58	0.87	1.53	0	Surface OK	No effect	1/8 in. warp, slight etch
Lab. Plastic No. 2	285	S-1	MS	3.3	32	245000	7420	0.54	0.79	1.45	1/64	Slight etch	No effect	1/8 in. warp, slight etch
Lab. Plastic No. 3	285	S-1	MS	2.5	17	200000	6140	0.67	0.94	1.48	0	Slight etch	No effect	1/8 in. warp, slight etch

Notes:
(1) Impact, Charpy, notched, ft. lb. sq. in. run in accordance with A.S.T.M. D-256-38.
(2) Hardness, Rockwell M Scale, run in accordance with A.S.T.M. D-229-38-T using 10 sec. load, 10 sec. unloading. (See paragraph 47B for method of obtaining negative readings.)
(3) Modulus of Elasticity lb./sq. in., as calculated from cantilever bending in Olsen stiffness tester, 5 in.-lb. size.
(4) Flexural strength, lb./sq. in., calculated from data obtained as in (3).
(5) Percent gain in weight on immersion of conditioned 2 in. disk 1/4 in. thick in water, for times shown.
(6) Warp test: disks 2 in. dia. and .060 in. thick are laid horizontally with 1/2 in. protruding over an edge, and stored in a saturated atmosphere over water at 100 deg. F. for the time shown. Gain in weight and amount of warp, measured by pressing one edge of disk down and scaling off elevation of the opposite edge, are noted.
(7) Water resistance: disks as made for (6) are immersed for (a) 1 minute in boiling water; (b) 20 minutes in water at 70–80 deg. C., and surface appearance, warp, etc., noted.
All physical tests and preliminary conditioning carried out at 70 ± 2 deg. F. and 55 percent relative humidity.

15-second cycle, this is not hard to accomplish. It is essential to the production of strong pieces of this material that the aim be injection under pressure and not mere mold-filling. Plastics made with *W*-type cellulose acetate may be charged in a cylinder that has been operating on regular acetate without any trouble, and the material can be replaced again with regular acetate without losses caused by poor miscibility. Scrap from this *W*-type plastic may be mixed with that from regular acetate plastic without giving serious difficulty either on reinjection or in final properties.

While the higher injection temperatures of the material require the use of special dyestuffs in coloring, the *W*-type plastic can be made in all colors. The crystal tints are equal to the best available on the American market three years ago, though admittedly not quite the equal of those produced with the present regular grade cellulose acetate. Since the plastics based on *W*-type cellulose acetate generally have less plasticizer than those based on regular grade cellulose acetate, the shrinkage is less on aging. These plastics also have a higher softening point than regular acetate plastics, an advantage appreciated by users.

Weathering tests, in general, show that the material is more resistant to the elements than regular grade cellulose acetate, especially in the matter of surface crazing and warping. The material stands about two-thirds of the way between acetate and acetate-butyrate in these respects. Shrinkage is chiefly a matter of volatility of plasticizer. Since the *W*-type acetate gives best strength with the plasticizers used in secondary acetate rather than with those used in mixed esters, extremely low shrinkage is attained only at some sacrifice of impact strength.

The conventional methods of drilling, piercing, or sawing or otherwise working molded pieces, may also be used with those made from *W*-type acetate. Buffing up is scarcely necessary with such articles, since they show remarkable gloss when molded at the proper temperature. Best results in this respect require that extra care be taken to keep the molding powder from absorbing water vapor prior to charging in the injection machine. Compression molding or hot-forming of molded shapes is not recommended except on the softer varieties of this material, because the higher melting characteristics of the harder formulations make it difficult to get a thorough softening and reshaping by these methods.

In summation then, the use of a 58 percent–acetic cellulose acetate gives a plastic which, while having all the properties of the conventional acetate plastic, has much improved water-resistance and heat-resistance. It gives inherently better gloss, shrinkage, and weather-resistance than conventional acetate plastics, and can be formulated in the regular ranges of stiffness, flow, and color. The material produces plastics without critical molding conditions and free of unusual odor. An important advantage is the fact that the material can be mixed with other acetate material, either in the injection chamber or the scrap drum.

New vinyl molding materials*

by L. K. MERRILL**

A FEW years ago a group at Cleveland was assigned the task of exploring the practical possibilities of the vinyl resins in articles of commerce for the molding industry. Fortunately, the management saw fit to define the approach in just exactly that way and there were no preconceived ideas or definition of the goal that was to be striven for, other than it was to be based on defining both the possibilities and limitations of these resins and determining wherein they deserved to play a legitimate part in the industry.

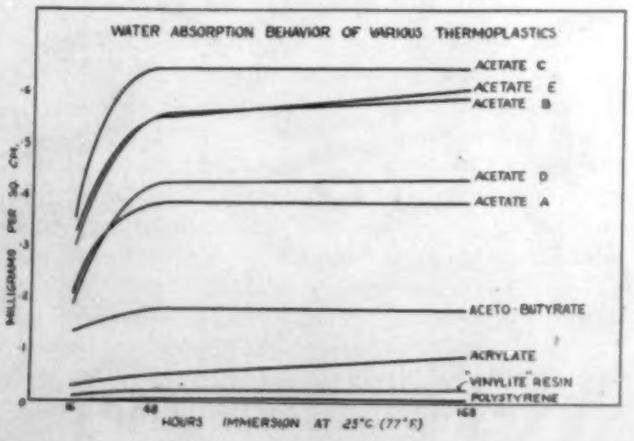
The resins to be discussed in this paper are known under the trade name *Vinylite*[1] and are those of the chemical series represented by the conjoint and copolymerization of vinyl chloride and vinyl acetate. By this is meant that these ingredients are put together in their monomeric state and, under suitable conditions of temperature, pressure, and catalyst, caused to polymerize or combine into a definite, though complicated, chemical entity. These compounds of vinyl chloride and vinyl acetate go back to the basic raw materials of natural gas, salt water, coal, and air which represent sources that are not subject to violent fluctuations in either price or availability, a point to be considered particularly in these times. Subsequent reference to copolymer vinyl resin in this paper will be understood to refer to these conjoint polymers of vinyl chloride and vinyl acetate which are known as Series V, *Vinylite* synthetic resins.

The resins, as a series, range in molecular weight from 6000 to around 25,000 and are characterized by certain inherent thermoplastic and physical characteristics. Those in the lower molecular weight range possess the property of being softer and of greater plasticity at any given elevated temperature whereas the higher molecular weight materials are stiff, hard, and lower in plasticity and flow behavior. In effect, therefore, a controlled mixture of these different molecular weights permits of compounds that are essentially self-plasticized and removes the necessity for the use of addition agents to obtain variations in flow behavior. This feature is definitely taken advantage of and probably accounts, in part, for the desirable aging characteristics which the materials exhibit.

The commercial availability of copolymer vinyl resins pretty well coincided with the advent of injection molding as a commercial fabricating method in this country. While considerable work was done with these resins in compression molding, progress was retarded because of the limitations of the equipment available at the time, and attention was, therefore, primarily concentrated on the injection molding process.

One of the first things encountered in the injection molding of copolymer vinyl resin was its seeming inherent sensitivity to thermal abuse in any fabricating process. Prolonged exposure to temperatures in excess of 225 deg. F. tended to cause a definite color change in the compound, the end point of which was heat decomposition of the material. This feature then became the basis for an active study of how the effect of that condition could be minimized and the approach was obviously from two standpoints: (1) The search for heat stabilizers or addition agents which, together with fundamental resin improvements, would prolong the time during which material could be subject to plastifying temperatures without degradation, and (2) the mechanics of uniformly introducing heat into a mass which was inherently poor in its natural thermal transfer properties without subjecting any increment thereof to dangerous temperatures.

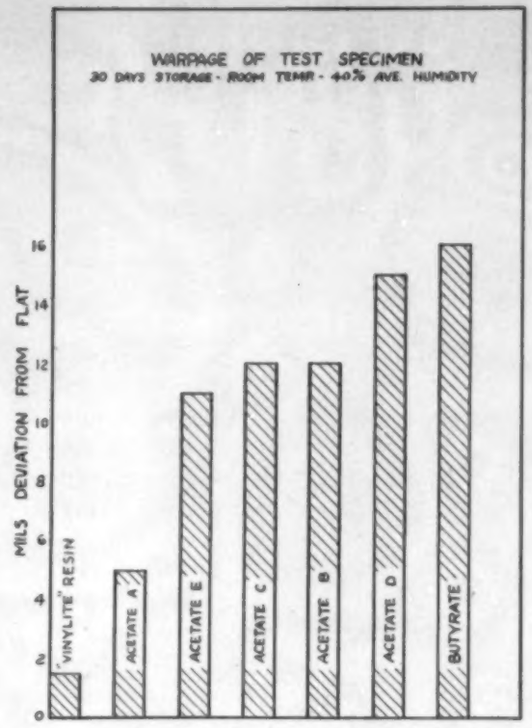
The first of these factors (heat stabilizers) is, and probably always will be, under development, but it suffices to say that up to the present time the heat stability of copolymer vinyl resins, as measured on a standardized test of the time of immersion in an oil bath at elevated temperatures required to cause a color change, has been raised from about 130 to around 300 minutes. A secondary factor enters into this consideration in that where heat stability is enhanced by addition agents, those constituents must not add to the stickiness and tackiness of the hot mass. It is believed that all too frequently this lubricity factor is lost sight of in the design of injection molding compounds. The



* Based on a paper presented at a meeting on *New Developments in Molded Plastics* in the Lecture Hall of the Franklin Institute, Feb. 13, 1940.

** Development Engineer, Vinylite Div., National Carbon Co.

[1] The word *Vinylite* is a registered trade mark identifying synthetic thermoplastic resin products of Carbide and Carbon Chemicals Corp.



ordinary concept of compound lubrication for compression molding is an entirely different story than the requirements of high velocity under the appreciably greater temperature and pressure conditions existing on the inside of an injection molding heating cylinder. For this reason a great deal of attention was devoted to the lubrication of copolymer vinyl resin injection molding compounds.

Coming then to the heating cylinder itself, investigations along this line have involved the use of all the conventional forms of heat including steam, hot water, hot oil, and electricity in the resistance and induction, or so-called magnetic, types. Heaters of all the available types were built. All commercially available materials of construction were used. It is hardly necessary to review the evolution of injection molding heating cylinders, which fortunately is still going on, but out of this work has come the type of cylinder proposed for use with copolymer vinyl resins. This cylinder has been designated as the "integral spreader construction" and has previously been described and illustrated in this journal.[2]

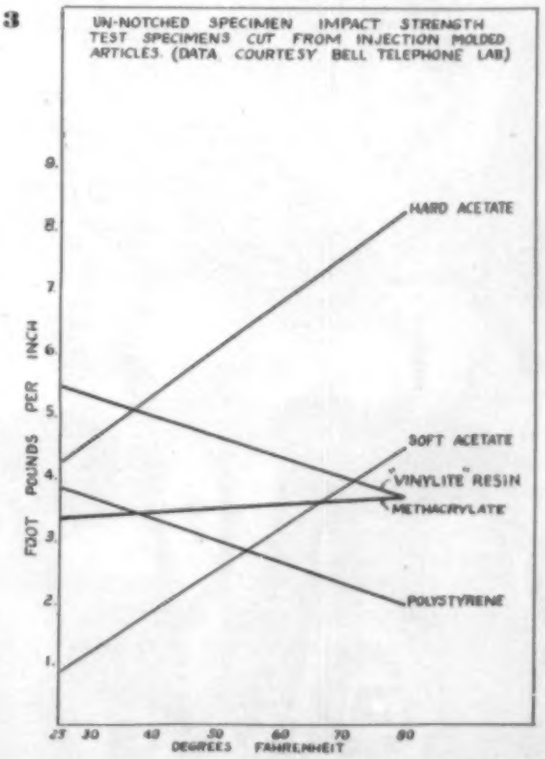
One of the inherent characteristics of copolymer vinyl resin is its chemical resistance. This has two aspects in the sense of (1) resistance to attack by other chemicals and (2) exceedingly low moisture absorption. This plastic is unaffected chemically by a larger group of the commonly encountered materials than any other single resin. A listing of those chemicals by which it is unaffected would include:

Practically all strengths of all mineral acids including hydrofluoric acid.
Sodium and potassium hydroxides.
Iodine, chlorine and bromine waters or tinctures.
Potassium permanganate and dichromate.
Silver nitrate.
Hydrogen peroxide.
Alcohols and polyalcohols.
Aliphatic hydrocarbons, but not the aromatic hydrocarbons.
Oils, fats, and waxes, of animal, mineral, and vegetable origin.

The other chemical aspect of low moisture absorption, whether by exposure to high relative humidities or direct immersion, is of definite significance. This is shown in Fig. 1 wherein copolymer vinyl resin and polystyrene are seen to be in a class by themselves. Practically, this means two things to the molder: (1) the granular compound's operating behavior is not sensitive to material storage conditions prior to or during use, and (2) the finished parts are not subject to shrinkage, warpage or distortion through exposure to humidity or even in actual contact with water. This feature is shown diagrammatically in Fig. 2.

The material is definitely non-flammable because its products of heat decomposition will not support combustion and this removes any usage or storage hazard for either the compound or the fabricated part.

Along with good electrical properties common to several thermoplastics, unplasticized copolymer vinyl resin exhibits the particular characteristic of extreme rigidity per unit of cross section, and this is accompanied by high tensile strength. There are data in the literature that imply a relatively low order of impact strength. To some extent this is true and especially so at high rates of application of the energy of impact. The unplasticized variety exhibits an elongation under strain of less than 2 percent. (*Please turn to page 90*)



[2] Modern Plastics, *16*, 26 (Feb. 1939).

Translucent phenolic laminate

by W. E. FLOOD*

FOR practically a quarter of a century phenolic laminated materials have played an important role in the field of plastics. They have found innumerable uses in the various fields of industry and the arts, and there has been a steady advance in improved products and sales of this material. However, until recent years, the color possibilities of these products were definitely limited. The appearance of translucent, light-colored phenolic laminates was made possible in 1935 by a specially processed liquid resin.[1] These new hydrophilic phenol-formaldehyde resins embodying sols which later form gels of colloidal structure in paper, fabrics, etc., during the coating process and before the final hardening stage in the press have produced laminates with improved flexibility and punching qualities without the use of plasticizers. Good tensile and impact strengths, moisture and electrical resistance, and odorless characteristics can now be obtained in light-colored laminates.

The trade is supplied with these liquid phenolics in varnish form, that is, the resin is cut with suitable solvents such as water, water and alcohol, alcohol and benzene, etc. Rigid control during manufacture is maintained throughout the process of manufacture. Viscosity, gelation time, pH, resin content, and color are held to meet laminator's requirements. These resins are furnished on specification basis only, and are adjusted to meet the job at hand.

The general method of using these resins is as follows: paper, fabric, fibers, etc., are saturated or coated with the liquid resin on the conventional types of coating equipment. Straight dipping, dip-squeezing, dip-scraping or reverse roll-coating can be employed. The treated material is dried in hot air currents to convert the resin to the gel stage, and to remove excess volatile solvents. The sheets are then cut to size, laid up in layers, and pressed between polished stainless steel plates in packs. The pressing operation, which consolidates the material to the finished plastic, can be varied according to the results desired. Pressure may vary from 600 to 1500 lbs. per square inch and temperatures from 130 deg. C. to 165 deg. C. Press time cycles can be adjusted to meet mass-production requirements. The material may go into the press cold and come out cold or go in hot and come out hot. Very short press cycles can be obtained under proper conditions without the use of accelerators.

Lower costs are again reflected in the feature of high wet strength imparted to paper during coating operations so that the material is handled easily on large treating machines of horizontal and vertical types, resulting in a minimum amount of web breakage. It might be added that in many cases only surface sheets impregnated with these (*Please turn to page 100*)

* Asst. Chief Chemist, Catalin Corp.

1 "Catavar" is the trade name the Catalin Corp. uses for laminating resins of this type.

Daystrom Corp. used Catavar (liquid phenolic laminating resin) for the colorful, waterproof top and apron on the table at left. Surface colors match or harmonize with leatherette upholstery. (Distributed by T. Baumritter Co., Inc.)

SERVING

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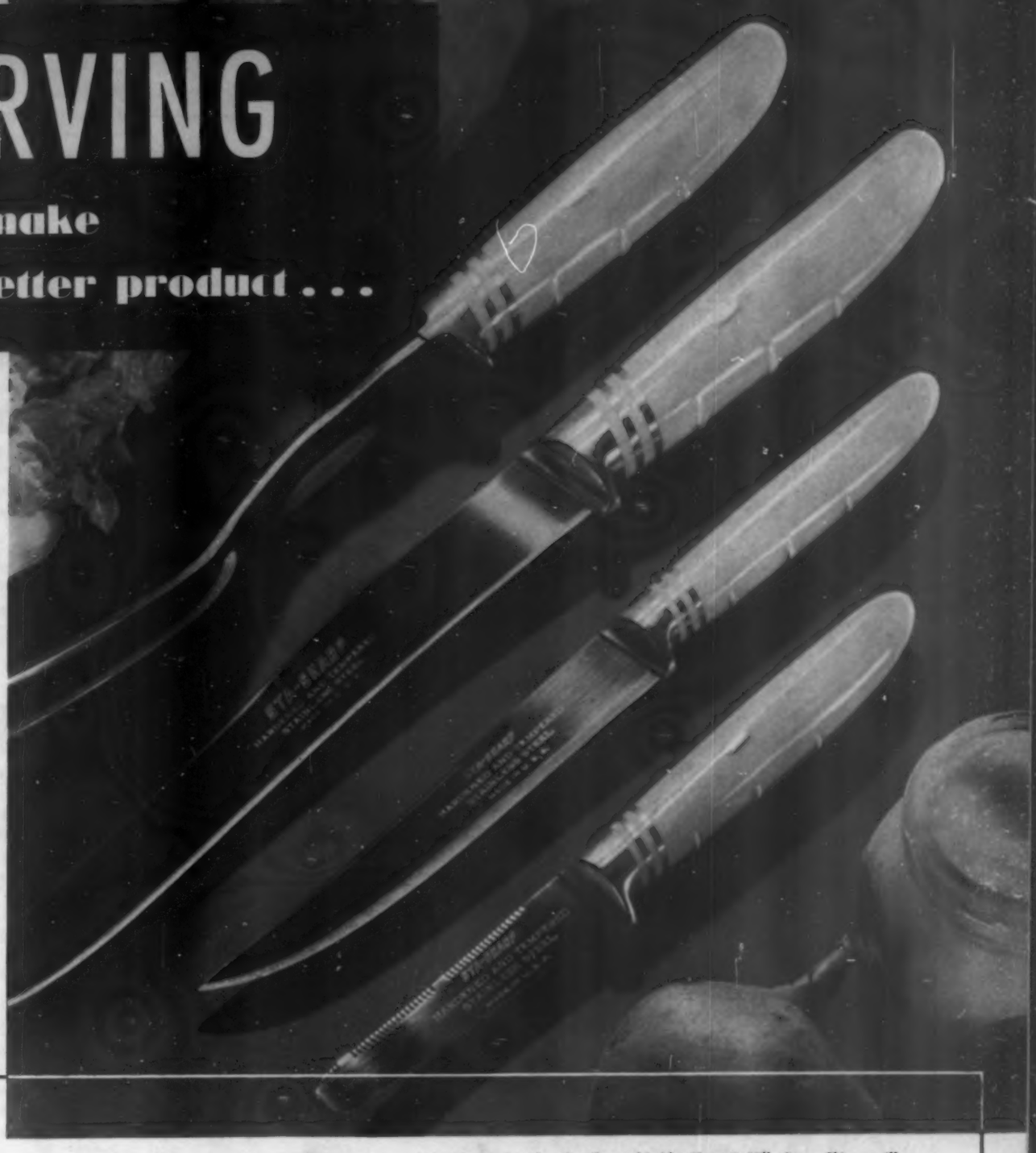

Sears Roebuck cutlery handles molded by Eimer E. Mills Corp., Chicago, Ill.

TENITE handles give added value to this redesigned cutlery. They are virtually unbreakable—cannot work loose—and will not tarnish or become yellow with age. The smooth, lustrous surface is easy to keep clean and provides a pleasant grip.

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General

PLASTICS CONTINUE TO ADVANCE. Chem. and Met. Eng. *47*, 78–80 (Feb. 1940). Trade review for 1939. In 1939 about 35 percent of laminated glass was made with cellulose acetate and 65 percent with vinyl resin. About four million pounds of polystyrene were produced, with the clear molding resin selling at about 52 cents per pound. Production of phenol resinous molding composition for 1939 is given as 54,000,000 pounds with 30,000,000 additional pounds of resin used for other purposes. Cast resin production is cited at about 6,000,000 pounds. Production of urea-formaldehyde molding composition is said to have been 14,000,000 pounds, selling at 27.5 to 35 cents per pound. Another million pounds of urea resin in solution, selling at 22 to 24 cents per pound, was used for laminating, cements, textiles, and other applications.

PROGRESS IN SYNTHETIC FIBERS. Chem. Industries *46*, 150–5 (Feb. 1940). Nature supplies four textile fibers, wool, cotton, linen, and silk. The consumption of these natural fibers has increased less than one-half in the last 25 years, whereas that of synthetic fibers has increased 750 times during the same period. Fibers made from cellulose are the most important of the synthetics, with viscose fibers making up two-thirds of this rayon group. Other new fibers include Vinyon (copolymer vinyl resin), nylon (amkyd resin), protein (casein and soybean), Lastex (rubber), and glass.

NEW PRODUCTS FROM WOOD. J. A. Lee. Chem. and Met. Eng. *47*, 95–7 (Feb. 1940). The Masonite Corporation has announced its intention to make molded containers from lignin plastic. Other products to be obtained from wood include furfural, acetic and formic acids, and activated carbon.

PLYWOOD. Fortune *21*, 52–55, 112–123 (Jan. 1940). This is the story of the plywood industry which grew from a production in 1925 valued at $32,500,000 to an estimated $80,000,000 figure in 1939. Synthetic resin adhesives are credited with having reopened the frontiers of this industry and extended its uses, decorative and structural, to a total estimated at over 2000.

Materials and Manufacture

PLASTICS AND RESINS FROM HYDROCARBONS. Ind. and Eng. Chem. *32*, 293–323 (Mar. 1940). A group of papers presented before a joint session of the Divisions of Petroleum Chemistry, of Paint and Varnish Chemistry, and of Rubber Chemistry at the September 1939 meeting of the American Chemical Society. For titles, authors, and abstracts of the papers in this symposium, see the Nov. 1939 issue of MODERN PLASTICS, page 94.

CELLULOSE ESTERS OF DIBASIC ORGANIC ACIDS. C. J. Malm and C. R. Fordyce. Ind. and Eng. Chem. *32*, 405–8 (Mar. 1940). Cellulose acetate acid phthalates are available as useful materials for special purposes.

Applications

CELLULOSE ACETATE IN AIRCRAFT MANUFACTURE. Plastics *4*, 32–4 (Feb. 1940). Many advantages are cited for the use of black acetate sheet for unstressed and slightly stressed parts on aircraft. Although duralumin is about 30 percent cheaper than black acetate, it is possible to produce acetate moldings at a figure below metal parts and in less time. Present applications include such parts as air ducts, scoops, fairings, spats, fillets, and many small accessories, with experimental development of a molded acetate spinner or hub for propellors now under way.

VINYON—A NEW TEXTILE FIBER. F. Bonnet. Am. Dyestuff Reporter *29*, 116–120 (Mar. 4, 1940). A discussion of the composition and properties of this new fiber.

TRANSPARENT PLASTICS. G. P. Young. Product Eng. *11*, 127–9 (Mar. 1940). Typical methods of mounting methyl methacrylate resin sheets for such applications as aircraft windshields, landing light covers, and the like, to avoid bulging and crazing are described and illustrated.

NEW RESEARCH ON THE USE OF HARDENING PLASTICS FOR AIRCRAFT CONSTRUCTION. W. Kuech. J. Royal Aero. Soc. *44*, 44–73 (Jan. 1940). Laminated materials incorporating plastics seem to be especially well suited for highly stressed aircraft construction. Paper-fabric- and wood-veneer-base materials treated with phenolic resin were tested for mechanical strength and resistance to water. Tests were also made on pure phenolic resin specimens and thermoplastics of the methacrylate and polyvinyl chloride types. Some experiments relating to the practical manufacture of airplane components are reported.

Coatings

PAINT BAKING WITH NEAR INFRARED. H. J. Bennett and H. Haynes. Chem. and Met. Eng. *47*, 106–8 (Feb. 1940). Incandescent lamps radiate about 90 percent of their input energy and are very efficient sources of heat for baking synthetic enamels and lacquers. Oil paints that require oxidation during drying are not as effectively handled by this method. Advantages of the radiant method of heating are low installation cost, speed, small floor space, better working conditions, and generally lower operating cost.

COATINGS 1919–1939. J. Marshall. Chem. Industries *46*, 15–20 (Jan. 1940). Special emphasis is given in this survey to the synthetic film-forming plastics which have had a conspicuous part in the developments in coatings during the past twenty years.

UREA-FORMALDEHYDE FILM-FORMING COMPOSITIONS. T. S. Hodgins, A. G. Hovey, and P. J. Ryan. Ind. and Eng. Chem. *32*, 334–45 (Mar. 1940). The properties and formulation of urea-formaldehyde resin finishes are reviewed. The resins in solution form, both by themselves and in combination with alkyd resins and plasticizers, are discussed as to their reactivity, stability, and solvent tolerances.

Testing and Properties

DEVELOPMENT IN PLASTIC TUBING. British Plastics *11*, 385–8 (Feb. 1940). Exposure of tubing used in the electrical industry to fluctuating conditions of heat and dampness is unavoidable. This article deals mainly with the results of 1 year's aging tests on cellulose acetate and polyvinyl chloride tubing. The tests included: (1) continuous heating at 60 deg. C., (2) continuous immersion in water at room temperature, and (3) exposure to 135–140 deg. F. and 65–75 percent relative humidity during the day, followed by cooling to room temperature with resultant saturated atmosphere at night.

ANALYSIS OF SYNTHETIC RESINS CONTAINING MALEIC ACID. E. Sadolin. Ind. and Eng. Chem. Analytical Ed. *11*, 608–10 (Nov. 15, 1939). Maleic-abietic acid is typically soluble in faintly acidic aqueous solution as contrasted with the consituents of rosin and phenolic resins. Phthalic acid from alkyd resin is removed in advance of the liberation of maleic-abietic acid.

U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each

ART OBJECTS. Henry Henriksen. U. S. 2,184,121, Dec. 19. Art works such as etchings, photographs, posters, signs, offset or rotogravure prints, cartoons and the like are impregnated with a clear, colorless heat-hardenable (preferably urea-formaldehyde or phenolic) resin and molded under high pressure in a mold having a frame delineating portion so that the finished object has a frame integrally molded with the picture or design. Artificial leaded glass effects are made in like manner.

POLYSTYRENE. T. A. Kauppi, K. D. Bacon and F. B. Smith (to Dow Chemical Co.). U. S. 2,188,903, Feb. 6. Plasticizing polystyrene resins with polycyclohexyl derivatives of aryl, aralkylphenyl, diphenyl or naphthy lethers.

PLASTIC SHEETING. Wm. V. Hutchinson. U. S. 2,189,-006, Feb. 6. Apparatus for supporting cellulose acetate or other thermoplastic sheets while being softened and shaped over a mold.

PHENOL-CELLULOSE RESIN. L. E. Champer and L. M. Christensen (to Chemical Foundation, Inc.). U. S. 2,189,132–3, Feb. 6. Making light-colored, soluble, fusible resins by acid condensation of phenol with cellulose under reducing conditions, followed by removal of excess phenol and polymerization to a C-stage resin.

SAFETY GLASS. Iwan Ostromislensky (to Carbide and Carbon Chemicals Corp.) U. S. 2,189,293, Feb. 6. A vinyl resin, used as the interlayer in safety glass, is formed by plymerization in situ.

PLASTICIZERS. S. L. Bass, T. A. Kauppi and F. B. Smith; S. L. Bass and E. C. Britton (to Dow Chemical Co.). U. S. 2,189,337 and 2,189,338, Feb. 6. Plasticizers for cellulose derivative molding compositions comprise aryl, aralkylphenyl, diphenyl or naphthyl ethers having from 1 to 6 cyclohexyl, dicyclohexyl, alkylcyclohexyl or arylcyclohexyl substituent groups; or polyhalogenated phenyl ethers, phenylated or not.

SULPHURIZED RESIN. Wm. H. Kobbe. U. S. 2,189,-468, Feb. 6. Improving the properties of sulphurized dihydronaphthalene polymer resins by a fusion treatment.

PLAYING BALL CENTERS. C. C. Davis and J. H. Gregory (to Wilson Sporting Goods Co.). U. S. 2,189,514, Feb. 6. Forming a hard semi-rigid shell around a fibrous center by lining a spherical mold with a phenol-aldehyde plastic, packing with vegetable fiber and molding under heat and pressure.

FRACTIONATING RESINS. P. D. Watson (to the People of the United States). U. S. 2,189,572, Feb. 6. Resins derived from lactic acid are separated by a fractional precipitation process into low polymer and high polymer fractions.

FLEXIBLE SHEETING. C. J. Malm (to Eastman Kodak Co.). U. S. 2,189,590, Feb. 6. Forming highly flexible sheets or foils by casting films from a solution of partially (not over 10 percent) hydrolyzed cellulose acetate-butyrate.

ABRASIVES. S. S. Kistler and C. E. Barnes (to Norton Co.). U. S. 2,189,733–4–5, Feb. 6. Interpolymerized methacrylate derivatives such as methyl and ethyleneglycol methacrylates, or methyl methacrylate and methacrylic acid, or methyl and allyl methacrylates, are used as binders for abrasive grains.

RESIN SOLUTIONS. B. N. Lougovoy (to Ellis-Foster Co.). U. S. 2,189,737, Feb. 6. Making phenol-urea-formaldehyde or urea-formaldehyde-acetaldehyde resins, and dissolving them in a blend of solvents, differing in boiling point but all having low surface tension. The products are useful as lacquers.

WATERPROOF VARNISH. Israel Rosenblum. U. S. 2,189,833, Feb. 13. Condensing a polyhydric alcohol with boric and maleic acids, and a phenol with formaldehyde and rosin, then heating the products together.

DOOR KNOB. C. J. Terrill (to Harry Davies Molding Co.). U. S. 2,189,845, Feb. 13. Molding frictionally retained knobs from a phenolic plastic.

FLOWER POT. Walter Engel. U. S. 2,189,889, Feb. 13. A molded synthetic resin pot is made with numerous capillary canals for moisture.

TRANSPARENT CONTAINER. L. D. Hokerk (to Kerk Guild, Inc.). U. S. 2,189,955, Feb. 13. An improved method for forming corners of containers made from clear plastic sheeting.

TAR RESIN. Jean J. Levesque. U. S. 2,190,033, Feb. 13. Making a resin by alkaline condensation of a wood tar distillate with phenol and aniline.

ALDEHYDE RESIN. W. Frankenburger, H. Hammerschmid and G. Roessler (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,190,184, Feb. 13. Condensing acetaldehyde, aldol or crotonaldehyde with a primary or secondary alkyl or cycloalkyl amine and a secondary heterocyclic base in presence of a surface active compound.

ADHESIVE. A. Menger (to Plaskon Co.). U. S. 2,190,239, Feb. 13. Compounding a urea-formaldehyde resin with a hardening agent and a polyhydric phenol in aqueous formaldehyde solution, and applying the composition as an adhesive before the resin hardens.

SYNTHETIC FIBER. E. Hubert, H. Pabst and H. Hecht (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,190,265, Feb. 13. Extruding a vinyl resin into a precipitating bath and stretching the resulting filaments while still plastic.

COLD MOLDING. F. J. Moore (to Plastics Molding Corp.). U. S. 2,190,605, Feb. 13. A resin made by alkaline condensation of phenol with formaldehyde is compounded with a filler in such manner as to yield a powder which can be molded under pressure without heat.

SLIDE FASTENERS. G. Sundback (to Talon, Inc.). U. S. 2,190,628, Feb. 13. Making slide fastener stringers from a soluble plastic.

(Please turn to next page)

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WATER-SOLUBLE RESIN. V. E. Meharg (to Bakelite Co.). U. S. 2,190,672, Feb. 20. Making water-soluble resins by alkaline condensation of a phenol with an aldehyde.

POLYAMIDES. W. H. Carothers (to E. I. du Pont de Nemours and Co.). U. S. 2,190,770, Feb. 20. Compounding a cellulose derivative with a fiber-forming linear polyamide resin.

STABILIZER. E. K. Ellingboe and P. L. Salzberg (to E. I. du Pont de Nemours and Co.). U. S. 2,190,776, Feb. 20. Stabilizing a heat-sensitive, light-sensitive chlorinated resin by adding a chlorine-free film-forming amine resin.

AMIDE RESIN. G. D. Graves (to E. I. du Pont de Nemours and Co.). U. S. 2,190,829, Feb. 20. Forming a carboxylic acid amide derivative of a phenol and condensing this product with formaldehyde.

COATED PAPER. Bert C. Miller (to Bert C. Miller, Inc.). U. S. 2,190,843, Feb. 20. Forming a thin, flexible, high gloss coating on paper by applying a film of a molten composite resin.

STYRENE INTERPOLYMERS. S. M. Stoesser and A. R. Gabel; S. L. Bass, S. M. Stoesser and R. D. Lowry (to Dow Chemical Co.). U. S. 2,190,906 and 2,190,915, Feb. 20. Interpolymers formed from styrene and tung oil or oiticica oil are insoluble in the common solvents.

MOLDINGS. M. Phillips and M. J. Goss (to the People of the United States). U. S. 2,190,909, Feb. 20. Making fibrous molded articles by activating lignin with alcohol in presence of an acid catalyst, and hardening the activated lignin under pressure.

TREATING TEXTILES. G. Widmer and W. Fisch (to Ciba Products Corp.). U. S. 2,191,462, Feb. 20. Impregnating fabric with an aminotriazine-aldehyde condensation product and heating to resinify the product in situ.

LACQUER. R. Endres (to Deutsche Hydrierwerke Aktiengesellschaft). U. S. 2,191,428, Feb. 20. Waterproof lacquers and plastics comprising cellulose derivatives plasticized with tetrahydrofurfuryl esters of stearic or like fatty acids.

SURFACE COVERING. N. P. Harshberger and S. A. Ochs (to Bakelite Building Products Co.). U. S. 2,191,465, Feb. 27. Building units having a base with ridges and corresponding indentations in a suitable design, the ridges being supported against deformation by a hardened composition.

ACRYLATE POLYMERS. J. W. C. Crawford and J. McGrath (to Imperial Chemical Industries, Ltd.). U. S. 2,191,520, Feb. 27. Emulsion polymerization of alkyl acrylates to obtain resins in granular form.

POLYAMIDE FIBER. W. H. Carothers (to E. I. du Pont de Nemours and Co.). U. S. 2,191,556, Feb. 27. Making fiber-forming polyamide polymers from a diprimary diamine and a dicarboxylic acid.

INSULATED WIRE. P. Nowak, H. Hofmeier and C. Tobis; P. Nowak and T. Triantaphyllides; G. Pohler (to General Electric Co.). U. S. 2,191,580, 2,191,581 and 2,191,584, Feb. 27. Coating wire with a heat-treated mixture of polyacrylate ester and polyacrylonitrile, or with such a resin blended with a heat-hardenable (alkyd or phenolic) resin, or with a simple polyacrylate resin, the heat treatment in each case being such as to impart increased insulating power and moisture resistance.

POLYETHER RESIN. H. S. Rothrock (to E. I. du Pont de Nemours and Co.). U. S. 2,191,587, Feb. 27. Condensing a thermoplastic ether resin with formaldehyde to form a thermosetting resin.

LEATHER FINISH. H. J. Haon (to E. I. du Pont de Nemours and Co.). U. S. 2,191,654, Feb. 27. An emulsion lacquer for leather contains a polymerized ester (propyl to octyl) of methacrylic acid, modified with shellac or wax.

MOLDING THERMOPLASTICS. D. M. Anderson (to Standard Products Co.). U. S. 2,191,703, Feb. 27. In molding thermoplastics by joining separate streams the weld line is eliminated by tapering the mold cavity and providing a gate for discharging a portion of the material.

KETONE RESIN. E. E. Novotny and G. K. Vogelsang. U. S. 2,191,802, Feb. 27. Making a resin by alkaline condensation of a straight ketone with an aldehyde (formaldehyde to hexanal).

WATER PURIFICATION. Eric L. Holmes. U. S. 2,191,853, Feb. 27. A sulphited phenol-formaldehyde resin is used for contact purification of a liquid containing undesirable components.

MOLDING COMPOSITION. R. W. Belfit (to Plaskon Co., Inc.). U. S. 2,191,949, Feb. 27. Making a resin by neutral condensation of urea with formaldehyde, and compounding it with a fibrous filler and thiourea.

UREA RESIN. D. E. Edgar and P. Robinson (to E. I. du Pont de Nemours and Co.). U. S. 2,191,957, Feb. 27. Condensing urea with formaldehyde in presence of an alcohol.

MOLDING COMPOSITION. A. M. Howald (to Plaskon Co.). U. S. 2,191,960, Feb. 27. Compounding a heat-hardenable urea resin with a fixative for the formaldehyde liberated at molding temperatures, and molding in a hot press.

MOLDED HEEL. Sidney Caplan. U. S. 2,192,026, Feb. 27. A shoe heel and shank, molded in one piece, is strengthened by reinforcing pins and adapted for attachment of a lift and insole.

LIGNIN PLASTIC. H. Burmeister (to General Electric Co.). U. S. 2,192,030, Feb. 27. Condensing lignin (from saccharification of wood) with phenol to make a plastic.

UREA RESIN. C. Ellis (to Ellis-Foster Co.). U. S. 2,192,129, Feb. 27. Condensing urea with formaldehyde in a nearly neutral medium, and compounding the product with a fibrous filler.

LICANIC ACID RESIN. A. E. Rheineck and B. Rabin (to Devoe and Reynolds Co.). U. S. 2,192,152, Feb. 27. Heating licanic acid to expel water and decompose the acid to a resinous product.

SAFETY GLASS. C. J. Malm (to Eastman Kodak Co.). U. S. 2,192,196, March 5. Safety glass with a wide range of temperature stability contains as interlayer a highly plasticized high viscosity cellulose ester.

INJECTION MOLDING. H. W. Johnson (to Celluloid Corp.). U. S. 2,192,263, March 5. Improved pressure cylinder, with adapter and torpedo, for injection molding of thermoplastics.

TRANSPARENT FOIL. E. F. Izard and J. A. Mitchell (to E. I. du Pont de Nemours and Co.). U. S. 2,192,314, March 5. Moistureproof heat-sealing wrapping foils comprise transparent regenerated cellulose sheeting coated with a lacquer containing wax, dewaxed gum dammar and a plasticized film-former.

SULPHUR DIOXIDE RESINS. F. E. Frey and L. H. Fitch, Jr.; F. E. Frey, R. D. Snow and L. H. Fitch, Jr. (to Phillips Petroleum Co.). U. S. 2,192,466–7, March 5. Making resins by treating olefins with sulphur dioxide in presence of a nitrogen oxide; or by reaction of diallyl with sulphur dioxide.

LACQUER. C. Bogin (to Commercial Solvents Corp.). U. S. 2,192,583, March 5. Using nitroethane or its homologs as solvents in stable, resistant protective or ornamental coatings containing a resin of the vinyl chloride:vinyl acetate type.

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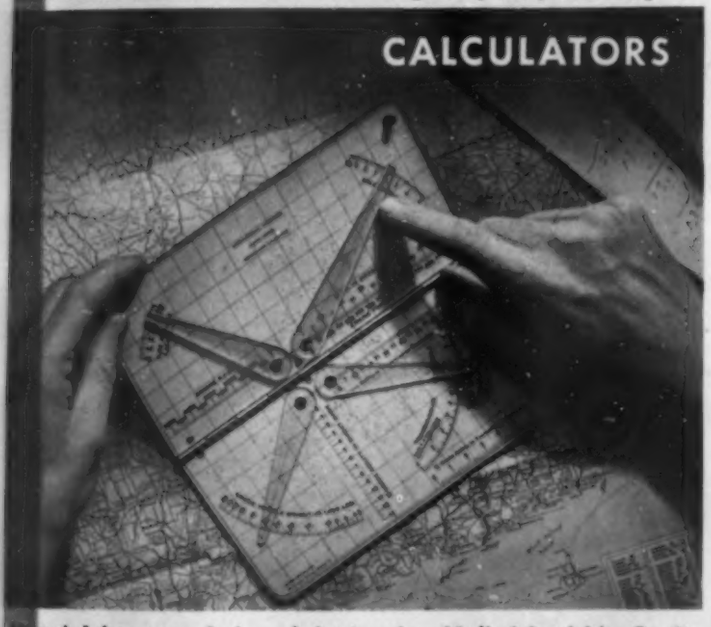

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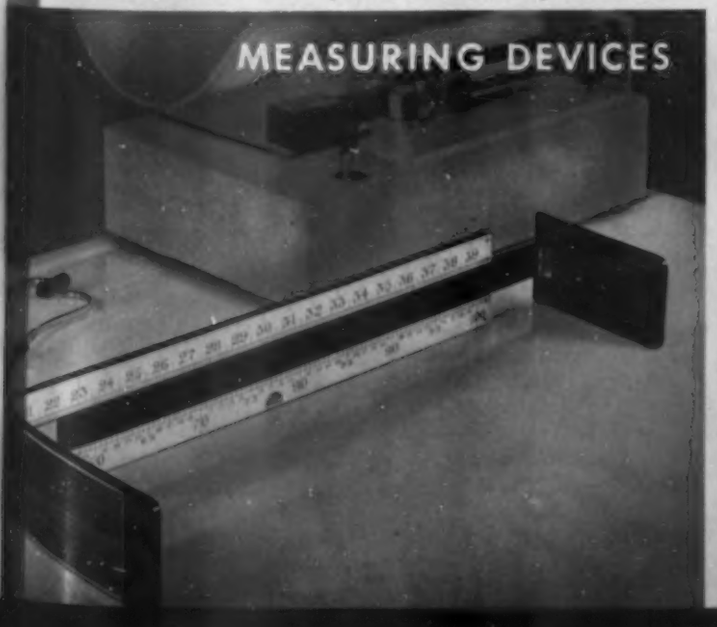

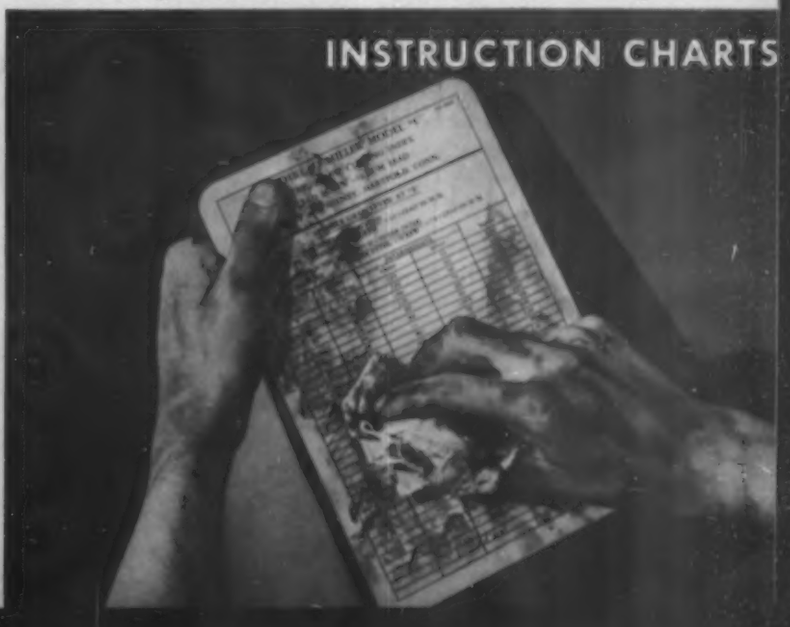

Foreign Plastics Patents

Application dates are given for patents of European countries, but for Canada the issue date is given

WALL COATINGS. A. Floff and G. Wick (to I. G. Farbenindustrie Aktiengesellschaft). German Patent 683,067, Dec. 29, 1937. Wood, cement, concrete and other porous surfaces having low heat conductivity are covered with several coats of after-chlorinated polyvinyl chloride, deposited from solution, a foil of polyvinyl chloride is applied before the last coat is dry, and the foil is in turn coated with after-chlorinated polyvinyl chloride.

ACETAL RESIN. I. G. Farbenindustrie Aktiengesellschaft). German Patent 683,165, June 7, 1929. Making resins by condensing polyvinyl alcohol with an aldehyde in an aqueous solution of a strongly acid electrolyte.

ELECTRIC INSULATION. Bakelite Gesellschaft. German Patent 683,804, Sept. 19, 1934. Insulating composition comprising a hardened phenolic resin, blown castor oil and lignite as filler.

MOLD. Aktiebolaget Swedish Artid. German Patent 683,-759, Oct. 20, 1937. A mold for making hollow synthetic resin moldings comprises one member of a hard metal such as cast iron and one of a plastic metal such as tin.

FRICTION FACINGS. H. L. Bender (to Bakelite Corp.). Canadian Patent 386,016, Jan. 2, 1940. Condensing alkenephenols with an aldehyde to form a binder for friction facings.

ABRASIVES. A. L. Ball (to Carborundum Co.). Canadian Patent 386,034, Jan. 2, 1940. Wetting abrasive grains with aqueous alkali, mixing with a synthetic resin powder and molding till the resin is hardened.

ELECTRIC CONDENSERS. T. R. Scott and A. A. New (to Standard Telephones and Cables, Ltd.). British Patent 508,057, June 26, 1939. Insulating tape for use in condensers is made of a polystyrene, polyisobutylene or polyethylene resin and an inorganic filler such as mica, marble, rutile, corundum or the like.

VARNISH RESIN. Bakelite, Ltd. British Patent 507,770, June 20, 1939. A resin made by alkaline condensation of a substituted phenol with formaldehyde is dissolved in a bodied drying oil for use in varnishes, floor coverings and molding compositions.

SULPHONAMIDE RESIN. Wm. H. Moss. British Patent 506,999, June 5, 1939. Resins are formed by alkaline condensation of a phenol such as diphenylolpropane with an arylsulphonamide and a dichloride such as glycerol dichlorohydrin; the products are useful for creaseproofing textiles and for making varnishes and molding compositions.

UREA RESINS. Imperial Chemical Industries of Australia & New Zealand, Ltd. Australian Patent 107,625, June 15, 1939. Condensing ureides of dicarboxylic acid monoesters with formaldehyde to make heat-hardenable resins which are compatible with cellulose derivatives.

WATERPROOFING PAPER. Raoul Römer. Swiss Patent 203,442, June 16, 1939. Rubber hydrochloride, with or without synthetic resins, is used for rendering paper waterproof and resistant to chemicals.

RESIN VARNISH. N. V. Industrieele Maatschappij voorheen Noury & van der Lande. Dutch Patent 46,234, July 15, 1939. Raw Isano oil, which is not a drying oil, is heated with synthetic resins or the like to make a product for varnishes, cable compositions, linoleum and the like.

EXTRUDED SHAPES. Peter Kopp. German Patent 683,-283, Dec. 12, 1933. Rods and other elongated shapes are molded from hardenable synthetic resins in an extrusion press.

FLOOR COVERING. Karl Vierling (to I. G. Farbenindustrie Aktriengesellschaft). German Patent 683,024, Dec. 29, 1937. A resin formed by condensing adipic or alkyladipic acids with a polyhydric alcohol is used as binder in floor coverings.

COATED ABRASIVE. N. E. Oglesby (to Behr-Manning Corp.). Canadian Patent 386,152, Jan. 9, 1940. Abrasive grains are coated with a hard, tough, waterproof resin and bonded to a flexible backing.

ALKYD RESIN. B. W. Norlander and M. C. Agens (to Canadian General Electric Co.). Canadian Patent 386,307, Jan. 16, 1940. Dissolving shellac in soybean oil and the fatty acids from linseed oil, and effecting an alkyd resin condensation.

DYNAMO INSULATION. K. E. Prindle (to Dobeckmun Co.). Canadian Patent 386,473, Jan. 23, 1940. Laminated insulation between the core and windings in a dynamo is made of rag sulphite paper, faced on both sides with cellulose acetate.

ABRASIVE WHEEL. A. G. Scutt and A. L. Ball (to Carborundum Co.). Canadian Patent 386,463, Jan. 23, 1939. An abrasive wheel containing two abrasives differing in hardness is bonded with a synthetic resin and also contains as filler a synthetic resin which was cured and powdered before mixing with the abrasive.

ALKYD RESIN. Wm. H. Butler (to Bakelite Corp.). Canadian Patent 386,445, Jan. 23, 1940. Salicylic acid is condensed with formaldehyde and the product is dehydrated, then condensed with glycerol.

PHENOL RESIN. H. L. Bender (to Bakelite Corp.). Canadian Patent 386,446, Jan. 23, 1940. Heating a phenol with an unsaturated fatty oil in presence of zinc oxide to make a resin.

SOLUBLE RESIN. Israel Rosenblum. Canadian Patent 386,556, Jan. 30, 1940. Forming a phenol aldehyde resin in presence of a terpene such as dipentene.

POLYMERS. I. G. Farbenindustrie Aktiengesellschaft. French Patent 840,631, April 28, 1939. Rubber-like polymers which do not harden in storage are made by emulsion polymerization of 2-chlorobutadiene while forcing the dispersion through a long, narrow reaction chamber.

DIOLEFIN POLYMERS. Instituto per lo Studio della Gomma Sintetica. French Patent 840,756–7, May 3, 1939. Making rubber-like products by polymerizing butadiene in presence of vinylacetylene, methylvinylacetylene or phenylvinylacetylene; or in presence of myrcene, phellandrene, methylisopropenylcyclohexene or methylisopropenylcyclohexadiene.

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Industrial Solvents

by Ibert Mellan
Reinhold Publishing Corp., 330 W. 42nd St., New York, 1939

Price $11.00 **480 pages**

The present annual production of about 1,600,000,000 pounds of solvents in the United States is cited by the author as evidence of the mounting industrial importance of solvents. Approximately one fourth of the book deals with the theory of solutions and practical considerations in the use of solvents and plasticizers, such as dilution ratio, evaporation rate, viscosity, flammability, and toxicity. Miscellaneous industrial applications of solvents are also discussed in this section of the book. Most of the remainder of the book is concerned with the physical properties and solvents powers of hydrocarbons and their hydrogenated and halogenated derivatives, alcohols, aldehydes, acids, ketones, ethers, esters, and plasticizers. The book is concluded with a detailed discussion of the graphical expression of solubility data and the interpretation of such curves. The wealth of tabular and graphical information assembled by the author and amply indexed makes this book an important contribution to the literature on solvents. G. M. K.

Mechanische Festigkeit von Phenol-Formaldehyd-Kunststoffen

by August Thum and Hans-Rudolph Jacobi
Published by VDI-Verlag G.M.B.H., Dorotheenstr. 40, Berlin NW 7, 1939

Price: RM 5 **39 pages, 136 illustrations, 8 tables**

This booklet presents a detailed report of an investigation of the mechanical strength of phenol-formaldehyde resinous plastics of the cast, molded, and laminated types. Tensile, compression, flexural, and torsion strengths were determined. The tests were made under both static and dynamic loading. Of particular importance is a contribution to our knowledge of the strength of laminated plastics reinforced with steel wire. A 190 percent increase in the flexural fatigue strength of laminated paper-base plastic with only a seven percent increase in weight was obtained by using steel wire reinforcement. A list of 79 references is appended to the report. G. M. K.

Uses of Lac

by H. K. Sen and S. Ranganathan
Published by India Lac Research Institute, Namkum, Ranchi, Bihar, India, 1939

Price: 1 rupee 4 annas **78 pages**

The various uses of lac and shellac are reviewed in this booklet. The topics discussed, which the authors note are taken up in the order of their commercial importance to the shellac trade, are phonograph records, electrical insulating materials, protective and decorative coatings, hat industry, sealing-wax manufacture, grinding wheels, and miscellaneous applications. Recent research developments in the manufacture and utilization of lac are considered in the concluding chapter. G. M. K.

METAPLAST CORP., 244 FIFTH AVE., NEW YORK, HAS issued a new bulletin describing the Metaplast process of plating on plastics. Methods as well as various applications are outlined and equipment and costs are discussed.

Design This Day

by Walter Dorwin Teague
Published by Harcourt, Brace & Co., 383 Madison Ave., New York, 1940

Price $6.00 **291 pages**

Plainly the work of a master, Mr. Teague's book provides a comprehensive record of design since the beginning of the Machine Age—even before. He traces the pattern of human endeavor in its efforts to provide shelter and useful tools for the protection and enjoyment of life. He points to the good and bad in these efforts and reveals reasons for each which many of us, being less experienced, are not likely to discover by ourselves.

Mr. Teague sees the birth of a new world-order coming as the result of a growing mastery over Machine Age tools and materials. He outlines a program with an immediate beginning and a definite goal which industry will do well to read and follow. His arguments are backed with 128 pages of pictures illustrating the new order he believes to be emerging in our modern world. E. F. L.

"LUMARITH MOLDING MATERIALS" IS THE TITLE of a new 36-page reference book of interesting data compiled by Celluloid Corp., 180 Madison Ave., New York, for those concerned with molding the material. The physical properties of various Lumarith formulas are presented in table and chart form, classified and arranged according to types, and their applications described. Also methods are outlined for using the data in selecting the most appropriate formula to meet the specifications of the finished article and production requirements.

A NEW ILLUSTRATED FOLDER ON STANDARD SEMI-Automatic Molding Presses for use in the production of plastic moldings and mechanical rubber goods has been issued by the F. J. Stokes Machine Co., Tabor Rd., Philadelphia, Pa., sole sales representatives for this line of equipment. These presses, from 20 tons to 300 tons capacity, are now all equipped with automatic time-cycle controls, all steps in the molding cycle being performed automatically with the exception only of loading the molds and removing the finished parts.

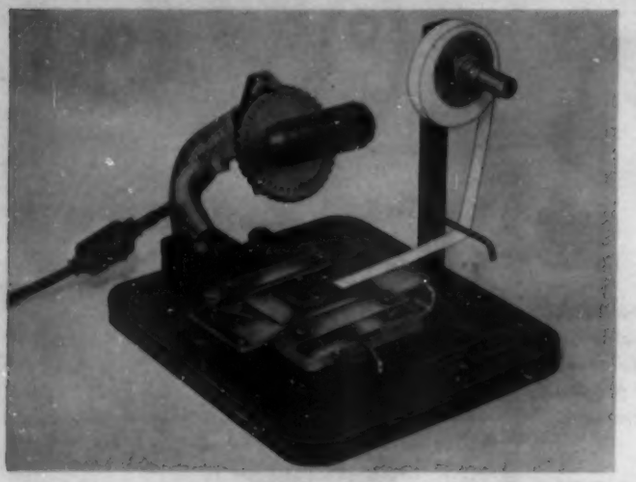
METALLIZING ENGINEERING CO., INC., 27-01 41ST Ave., Long Island City, New York, has issued a bulletin describing in detail the new process of "Metcolizing" which is claimed to protect metals against oxidation and scaling at high temperatures, and alloys against attack of sulphurous gases.

TURNING THE OLD WOOD LOT INTO COMMERCIAL farming at a substantial profit is graphically outlined and presented in a booklet titled "Forest Products Utilization in the National Economy" compiled by (and available through) Robert B. Goodman, Marinette, Wisconsin. Mr. Goodman details the importance of Agriculture and Forest Land Use and points out the comparative advantages to the farmer of Woodland against Crop Land supporting his contentions by comments gathered from many reliable sources of spoken and written information.

With increasing demands for cellulose by the plastics industry, rayon manufacturers, etc., the promotion of wood research is imperative if anything like an adequate supply is to be available in the future and this compilation of data is worthy of serious study by those interested. Copies are available without cost.

THE 1940 18TH ANNUAL REVISED EDITION OF THE Market Guide for Latin America, a confidential sales guide and credit rating book, has recently been issued by American Foreign Credit Underwriters Corp., 84 William St., New York. This guide is leased to American firms for the development and handling of their export sales and credits at an annual subscription of $75, which also includes various auxiliary services for the twelve months' period. The book covers all the countries of South and Central America, Cuba, Puerto Rico, Mexico and the West Indies, listing buyers, distributors, agents, manufacturers, railroads, newspapers, etc., and contains general market data.

Equipment



DESIGNED FOR MARKING ON PLASTICS, THIS NEW hot stamping machine, illustrated above, lightweight, portable, weighing only 14 lbs., is said to require no skill in operation. The manufacturer, Identification Plate and Machine Co., Inc., suggests the use of this machine for personalizing individual items in plastics by imprinting names, initials, etc., directly at the point of sale, as any type plastic surface can be marked for the customer while he waits, it is reported. The machine can also be used for trademarking small items and advertising novelties.

ATLAS VALVE CO., AFTER COMPLETING A NUMBER OF service tests, now announces an improved Type *E* forged steel body high-pressure reducing valve for oil as well as water and air. A number of important improvements are claimed to have been effected to make the valve truly modern in every respect. The internal metal parts are entirely of stainless steel. A formed packing of special material said to be superior to leather has been adopted which is claimed immune not only to water but to oil and other fluids commonly used in hydraulic machinery.

The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure. It is recommended by the company that where the reduction is from a high to an extremely low pressure it be performed in two stages using a lower pressure valve for the second stage.

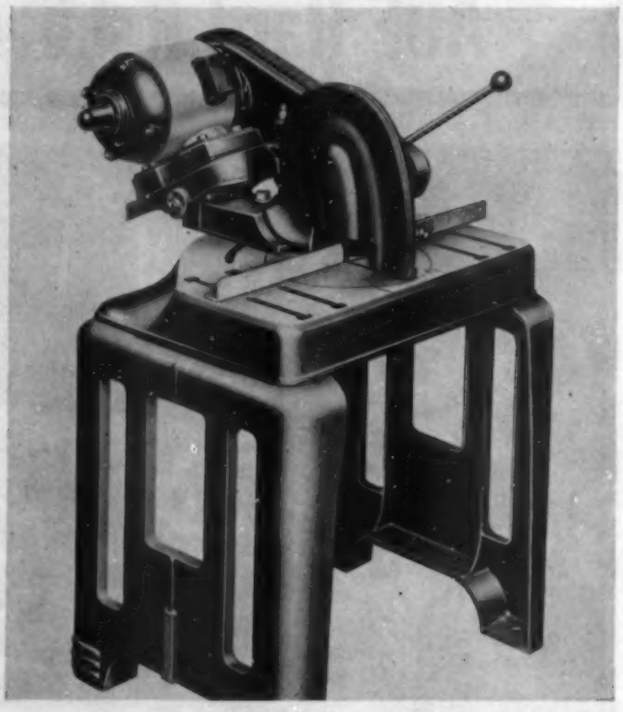
TEICHERT ENGRAVING MACHINERY CO. ANnounces a new low-priced bench-type American-made pantograph for engraving, etching, and routing on plastics, light steel and metal work. The machine is 20 in. high, 17 in. wide, and 10 in. deep. The drill motor can be geared from 1000 to 2700 R.P.M. Flat, concave and convex surfaces can be engraved effectively, it is claimed, and the machine is designed for simplicity allowing operation without special training.

A NEW PORTABLE POCKET CO_2 INDICATOR HAS BEEN added to the F. W. Dwyer Mfg. Co. line of combustion testing instruments. Among its features are the unbreakable transparent plastic construction, carrying case with built-in compartments for draft gage and thermometer, and self-closing valves which are said to eliminate any possibility of losing absorbent solution. It is reported to be simple in operation and is set up by making the rubber tubing connection. Analyses are run by holding the inlet plunger down while pumping the sample in and raising and lowering the absorption unit.

COMPACT, 50-TON CAPACITY PLASTIC MOLDING press has been developed recently, by the Hannifin Mfg. Co. It is air operated and requires about 80 lbs. unit pressure to develop 50 tons. A unique power stroke makes the press suitable for compression molding, it is reported. The pressure is developed through a combination lever and toggle mechanism developed specially for this kind of work. The platen advances rapidly but decelerates when the dies begin to close allowing time for the compound to soften. Smoother and denser products are said to result. The rate of up-travel and the return speed are both adjustable to suit the application. An important feature is that full tonnage is applied to break the mold when reversing the cylinder. If air is not available, this same press can be furnished with a completely self-contained hydraulic power unit. A variable delivery oil pump is used to maintain pressure during the cure and only a 2 H.P. motor is required.

STREAMLINED BALL MILL, BY ABBÉ ENGINEERING Co., is of all welded steel construction with shell made of extra heavy gage, high carbon or chrome manganese alloy steel. The unit is a style GPH mill mounted on pedestals with broad feet. The pedestal on the drive end has the motor base built integral with it. The geared head motor rests on a machined base which permits quick and easy alignment of the gear and pinion, according to company reports.

In addition there is an inching magnetic motor mounted brake, also a push button control on the pedestal, with a 3-button station for starting, stopping and inching the mill to the desired position and holding it there for charging or discharging.



AN ACCURATE, SPEEDY ABRASIVE CUT-OFF MAchine, announced by the Delta Manufacturing Co. is claimed to cut quickly and accurately to exact lengths such materials as steel, brass, copper, cast iron, monel metal, all plastic materials, wire rope, fibrous material such as brake linings, tile, brick, hard rubber, concrete coping and sand cores. On metal it is said to leave the cut with a polished surface, thus eliminating many burring and finishing operations necessary. By switching to a saw blade this same unit can be used for cutting wood.

This rugged machine (illustrated above) cuts material at any angle and embodies safety features and improvements. Its capacity is reported to be up to 2 in. diameter, or material up to 2 in. by 6 inches.

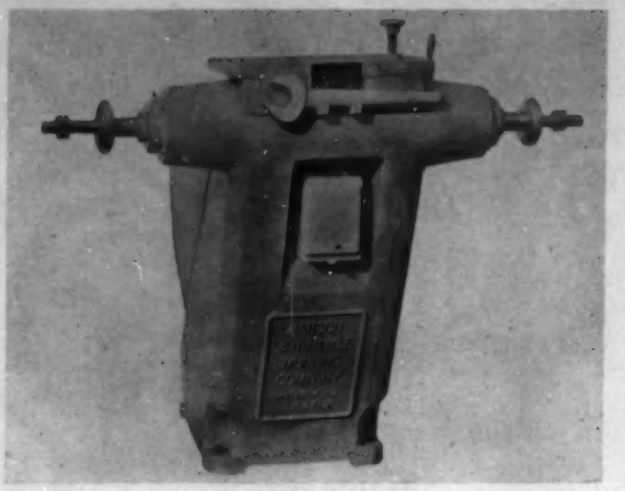
(*Please turn to next page*)

LABORATORY WORKERS WILL WELCOME THE latest improvement in the new Power-mix. This unit is now supplied by Chemical Publishing Co., Inc., with a Monel support arm which fits into any clamp and is said to allow the mixer to be adjusted at any angle. The new power-mix differs from most laboratory mixers, it is reported, because its extra power (made possible by special gearing) enables it to run continuously on the heaviest fluids such as glues, lacquers, paints, asphalts, heavy oils, syrups, food products, pharmaceuticals, latex, etc. Full power is developed at even the lowest speeds. Its speed may be varied from 0 to 1350 R.P.M.

VARIOUS DIFFICULT INDUSTRIAL OPERATIONS can now be precisely and economically controlled by the new Paragon series of automatic reset timers and time delay relays, according to the manufacturer. The following types of uses are suggested: 1. To close and then reopen a circuit, and vice versa; 2. To make a momentary contact; 3. To repeat a preset schedule of momentary contacts or timed *On* and *Off* operations; 4. To reset instantaneously after a power failure. These timers are furnished with eight terminals. A positive mechanical lock, magnetically operated, is said to eliminate all friction and magnetic clutches and frees the timer of any disconnection due to vibration.

THIS 50-TON PRESS ANNOUNCED BY THE WATSON-Stillman Co. is the latest addition to the W-S specially engineered line of fully automatic hydraulic compression molding machines—designed for molding thermosetting materials but adapted also to thermoplastics. Overall measurements are 8 ft. 10 in. long, 33 1/8 in. wide and 9 ft. 8 in. high. Weight is 11,000 lbs. Dimensions of die plates are: 10 in. (top to bottom), 18 in. (front to back), 10 in. (left to right). Vertical opening is 23 in. maximum; horizontal opening (between plates) 22 in.

The machine (illustrated above)—self-contained and furnished completely equipped—consists essentially of one vertical and one horizontal cylinder, a hydraulic power unit, and a feed and an ejector mechanism automatically operated and timed to function in proper sequence. Full-automatic control applies to all the successive operations, from the feeding of loose granular or preformed material into hopper, to the final ejection of molded parts.



A NEW BUFFING LATHE, DESIGNED FOR A RANGE OF work not requiring a heavy duty machine, has been developed by the Hanson-Van Winkle-Munning Co. manufacturer of electroplating equipment and supplies. As shown in the illustration, a generous overhang for clearance is furnished. The body of the lathe is a heavy one-piece iron casting and the base dimensions of all sizes are 24 in. wide by 20 in. deep.

Drive is by *V* belt, with quick belt changing a special feature. Any one spindle speed from 1800 to 3600 r. p. m. can be obtained, it is said, and other speeds can be had by changing the motor sheave pulley. The spindle is of 1 1/4-in. to 1 3/4-in. alloy steel.

LARGE SCALE ADAPTATION OF THE PRINCIPLE OF mixing by the method of cut-divide-remix is said to be contained in the engineering and design of the Prater Horizontal Mixer, announced by the Prater Pulverizer Co., as a part of its continuing engineering program in providing complete equipment for processing in industry. Rated at one ton capacity, of the horizontal drum type, this machine presents a new combination of mixing and lifting blades and dual spirals running in opposite directions within the drum.

A COMPACT INDUSTRIAL INSTRUMENT FOR AUTOmatic, accurate timing of a variety of electrical circuits is announced by the R. W. Cramer Co., Incorporated.

GEORGE SCHERR CO., INC., HAS PLACED UPON THE market a new product, Magne-Blox, a set of magnetic parallels and V blocks for use with magnetic chucks. Made of alternate laminations of brass and specially selected iron of high magnetic capacity, the set consists of 2 parallels measuring 1 in. by 1 3/4 by 3 3/4 in. and 2 V blocks measuring 1 3/8 in. by 2 3/4 in. by 1 1/8 in. furnished complete in hardwood case.

A NEW, LOW-PRICED COMPACT BALANCE THAT CAN be readily dismounted and stored in a laboratory drawer is announced by the Clay-Adams Co. This instrument has been designed to meet the needs of all balance technique, and at a price within the reach of the student in chemistry. It is supplied with brass weights.

SPECIAL FLANGE HEAD OIL IMMERSION HEATER has been made by Westinghouse Electric & Mfg. Co. for particular use in high pressure systems. The heater tubes are of steel, silver soldered into a cast iron head, and the units are made for both circulating and non-circulating systems, it is reported.

The non-circulating heaters have a rating of from 1 to 3 kw. for 115 or 230 volts with two heater tubes ranging in length from 14 7/8 to 37 7/8 inches. The circulating heaters have either 2 or 4 heater tubes from 33 3/8 to 37 7/8 inches long with a rating of from 5 to 8 kw. for 230 volts.

News

THE BRAZILIAN NATIONAL COFFEE DEPARTMENT has recently purchased a small plant in which experiments will be conducted in connection with the commercial production of plastics from coffee. Arrangements have been made to obtain the requisite equipment in the United States and it is expected that operations will begin within a few months of its delivery. (Dr. H. S. Polin of Polin Laboratories, New York, has gone to Brazil to supervize the plant installation.—Ed. Note)

The Coffee Department for some time has had under observation the experimental conversion of coffee into plastics invented and developed in the United States. It is reported that the process is capable of being developed along economic lines for commercial purposes. (American Consulate General, Sao Paulo)

AMERICAN INSULATOR CORP., NEW FREEDOM, Pa., has appointed Barto Attig its New York sales representative with headquarters at 101 Park Avenue. Mr. Attig spent five years in the company's plant and the past two years as salesman in the Detroit territory.

CELLULOSE ACETATE MOLDING COMPOUNDS wound up the year 1939 with a production of 11½ million pounds as compared with 7⅛ million pounds in 1938, according to a recent release by the Department of Commerce. January (1940) production was 1⅛ million pounds as against ¾ of a million for the same month last year. Sheets, rods and tubes in January were slightly under the figure for the same month a year ago. For the entire year of 1939, however, they showed a gain of 2¼ million pounds with a grand total of over 9 million pounds. Total production of cellulose nitrate sheets, rods and tubes showed a gain of nearly 4 million pounds over the figures 1938.

NIXON NITRATION WORKS OF NIXON, N. J., INFORMS us that W. A. Olsen, formerly of the main office Sales Department, has been assigned to represent the company in the Ohio, Indiana, Kentucky and Michigan territories.

A. C. WIEBE, NEW YORK REPRESENTATIVE FOR F. J. Stokes Machine Co.'s line of molding machinery, presses and equipment, reports that he has moved to larger quarters at 103 Park Ave.; telephone, AShland 4-3586.

HEADQUARTERS OF THE CHIKSAN TOOL CO. FORmerly located at Fullerton, Cal., are now established on the company's new property in Brea, Cal., where its general offices occupy its own modern office building (shown above). The property also includes facilities for housing the factory, testing department and stock warehouse. Machinery and equipment are being moved to the new location from the former plant as rapidly as production schedules will permit.

E. I. DU PONT DE NEMOURS AND CO. ANNOUNCED recently that it will award six post-doctorate fellowships for research in organic chemistry, and twenty post-graduate fellowships for research in the field of chemistry for the academic year 1940-41. The post-doctorate fellowships are for $2000 each, and the post-graduate fellowships are for $750 each. The fellowships are not restricted to subjects connected with the company's products and the university selects the beneficiary. Twenty institutions have been selected for the awards.

ELASTIC STOP NUT CORP. ELIZABETH, N. J., HAS REcently broken ground for a new plant on Vauxhall Road, Union, N. J., near Newark. The plant will be used solely for the manufacture of the company's line of self-locking nuts.

ON MARCH 15TH, W. L. KELLY, FORMER VICE-PRESIdent and country sales manager, severed his connection with Chicago Molded Products Corp. and retired from active business. He intends after a short vacation to devote his time to private interests. E. C. Maywald, executive vice-president of the company will continue in charge of all sales activities.

THE THIRD AND LAST OF A SERIES OF THREE TECHnical meetings sponsored by the Bakelite Corp., unit of Union Carbide and Carbon Corp., was held at The Franklin Institute, Philadelphia, Tuesday evening, March 12. D. J. O'Conor, president of Formica Insulation Co., spoke on "New Developments in Laminated Plastics." He discussed the acceptance of laminated material by furniture designers and architects and its use for panels and table tops in the Library of Congress and on the new Cunard liners—the Queen Mary and the Queen Elizabeth. George R. Meyercord, president of the Haskelite Mfg. Corp. speaking on "Improved Bakelite Resin-Bonded Wood Structures," described how plywood had been faced with metal to give it greater strength and how a thin sheet of asbestos was inclosed within the panel for greater fire protection. He also told of the development of the Fairchild Duramold plywood airplane that was designed by Colonel V. E. Clark. George Baekeland, vice president of the Bakelite Corp., presided as chairman.

PRODUCTION OF GLYPTAL RESIN HAS BEEN INcreased approximately 50 percent since March 1, when additional manufacturing equipment was put in operation at General Electric's glyptal alkyd resin plant in Schenectady, N. Y., according to an announcement of the G-E construction materials division, Bridgeport, Conn.

THE FIFTEENTH IN THE METROPOLITAN MUSEUM'S series of exhibitions of American industrial art will be held in 1940, opening with a private view for Members of the Museum on April 16, and to the public on the following day and continuing through September 15. It is planned to be a comprehensive display of house furnishings, consisting in part of room schemes and in part of other groupings of objects of industrial art used in decoration. All will be of American design and manufacture.

PLASTIC AND METALS PURCHASING CO. ANNOUNCES the opening of its offices at 205 Lafayette St., New York. This company says it has a practical idea in clearing-house service between rated buyers and dependable manufacturers, and is interested in listing sources of supply on injection and compression plastic molded products. (Phones: Canal 6-7530–1–2).

INTRODUCTION OF MASTER COPY TYPE, MADE OF durable plastic material, for three-dimensional pantographic engraving and die-cutting machines, is announced by H. P. Preis Engraving Machine Co., 157 Summit St., Newark, N. J. This type is intended for producing steel letter stamps, type and various classes of dies. It is furnished in heights of 5/32, ¼ and ½ in., and in eight variations of width, from very condensed to very extended.

(*Please turn to next page*)

BECAUSE THE WAR IN EUROPE HAS CAUSED SHIFTing in the sources of supply for raw materials of many nations, the American Nickeloid Co., Peru, Ill., has found increased demand for its pre-finished metals in many foreign markets, and to better serve this business, announces the establishment of an export office at 201 North Wells St., Chicago. Sales representatives are being established in all principal countries abroad.

A NEW INK FOR MARKING OR STAMPING ON FILM, foil, and materials with a cellulose acetate base and on laquered, varnished or glazed papers is announced by Clear Print Products Co., 15 E. 26th St., New York. This ink was developed for Clear Print stamp pads, chemically treated wood blocks, and is claimed to dry quickly without smearing. The ink is also impregnated in silk fabrics for typewriter ribbons for typing on film, foil, tracing cloth and papers.

IN A NATION-WIDE CONTEST CONDUCTED BY THE House Magazine Institute, 535 Fifth Ave., New York, to determine the best house magazines, the *Monsanto Magazine*, published by Monsanto Chemical Co., St. Louis, was adjudged the best in the internal field, the Institute reports.

WILLIAM B. LAWSON, FORMERLY OF HARSHAW Chemical Co. and International Nickel Co., announces the formation of W. B. Lawson, Inc., dealing in industrial chemicals, oils, and non-ferrous metals. Offices are in the Union Commerce Building, Cleveland, Ohio.

CRYSTALATE, LTD., GOLDEN GREEN, TONBRIDGE, Kent, England, have molded and assembled the Permanote desk pad (shown above) and are interested in negotiating for the disposal of the American patent rights. This novel pad incorporates a continuous strip of paper on a roll (ordinary adding machine paper may be used) and when the available writing space becomes full of notes, a simple movement of the mechanism by hand unwinds a further supply. Reference to previous notes can be obtained by turning one of the side knobs to wind back. When the roll is completed, it can be rewound on the spindle, removed, sealed and filed. A renewable yearly calendar fits in front and there is a rest for pen and pencil. A space on the top can be engraved with special advertisements.

JOHN W. DERHAM, PRESIDENT OF MOLDED PRODucts Ltd., Melbourne, Australia, has sent us this illustration of his new plant which was completed near the end of 1939. It is the largest and most modern plant in Australia and is equipped with every facility to turn out proprietary merchandise as well as custom molding.

The company manufactures and distributes an extensive line of urea and phenolic lamps and lighting fixtures as well as builders' hardware, picnic ware, stationery and tobacconists' accessories, and fancy goods or dress accessories. Industrial molding and laminating done by the company embraces radio, packages, refrigerator parts, knobs, dials and escutcheons, gears, wheels, tubing and other laminated products.

Many of us remember with pleasure Mr. Derham's visit to the United States a few years ago and I'm sure that everyone will wish to join us in publicly expressing our best wishes to him for future progress and prosperity.

A. BAMBERGER, 109 SO. FIFTH ST., BROOKLYN, N. Y., reports the opening of a new plant for regrinding all kinds of plastics scrap. Office and Warehouse are now located at the above address. New telephone number, EVergreen 7-3887.

A COMPREHENSIVE AND UNBIASED SURVEY ON THE position of the wholesalers since 1935 has been launched by the U. S. Census Bureau, the results of which will give pertinent statistical totals on the operations not only of wholesalers themselves, but of the manufacturers whose products they distribute and the retailers whom they service. Some of the factors to be considered include the cost of wholesale distribution; operating expenses; employment; location in relation to population; total sales on credit; commodity sales; retail sales and retail census on accounts receivable and stability.

Basic facts will be published by late summer or early fall with detailed reports to follow as rapidly as possible, depending on the promptness with which returns are received from all firms. Reporting to the Census Bureau is required by law but the same statute protects those giving the answers against disclosure of individual returns or their use for taxation, investigation, etc.

Wholehearted cooperation by businessmen in filling out questionnaires completely, and accurately, and returning them promptly to enumerators will enable the department to present a clear picture of the actual facts at any early date.

"GREATER SERVICE TO INDUSTRY AND THE Public" has been selected as the theme for the 1940 Spring Meeting of The American Society of Mechanical Engineers, which is to be held in Worcester at the Hotel Bancroft, May 1 to 3.

FOR THE THIRD CONSECUTIVE YEAR, THE ART School of Pratt Institute, Brooklyn, will hold its annual exhibit at 50 Rockefeller Plaza, Radio City, from May 4 to May 19, inclusive, 10 a.m. to 10 p.m. daily. The seven departments of the school will be represented: Architecture, Advertising Design, Industrial Design, Illustration, Interior Design, Art Education, and Evening School.

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Molding photographic history

(*Continued from page 46*) industry's lines. Just what it had to do with the creation of *candid camera-ing* is, of course, open to conjecture. But when the candid camera craze really took, the experience of the manufacturers with molded plastics decidedly gave them confidence. They had a material that was just about the *ne plus ultra* from a designer's point of view. Not only were his shapes and sizes almost unlimited but also the finishes, as any desired grain could be faithfully reproduced in plastics.

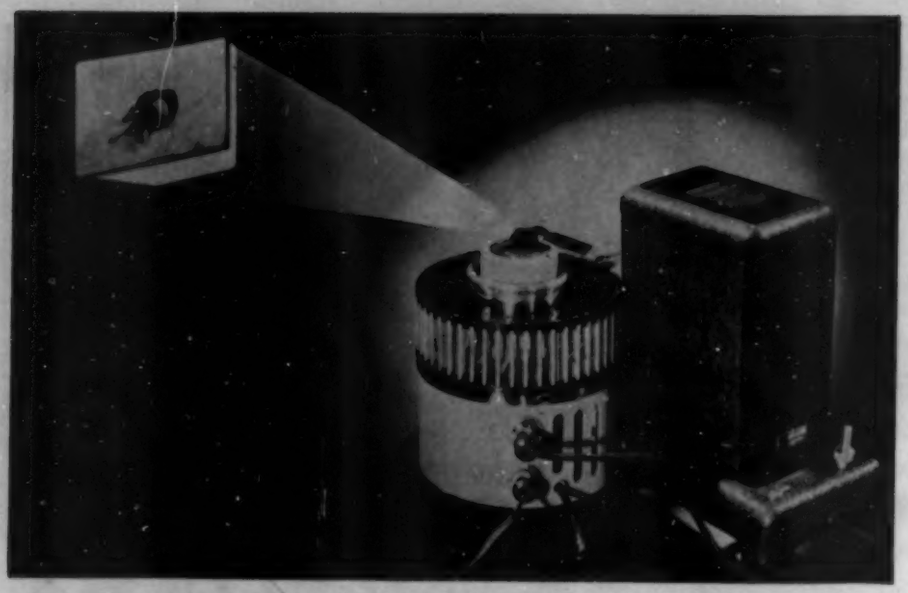
A number of types of exposure meters have naturally followed this lead of cameras in plastic housings. One of the early ones, Weston's (Fig. 12) employed a photo-electric cell similar to that which causes doors to open, detects smoke in chimneys. Its use in this exposure meter determined the amount of light under which the subject was photographed or which would enter the camera lens. In an oval shape, the Weston photronic cell was located in one half, and the gage needle, which its reaction operated upon, in the other. The housing for this unit had to be positively light-proof and unaffected by the reaction of the cell. Again, molded plastics proved the solution. It was molded in two snug-fitting parts, kept weight at the very minimum, and delivered an excellent smooth finish.

Another exposure meter which has been on the market but a short time, called Photrix,[3] is small enough to be worn conveniently on one's wrist. Here, too, that unusual combination of the many physical properties of plastics came into play. Plastics are unaffected by body heat or moisture, a feature of inestimable value for such a purpose as this one, particularly since the other characteristics are so desirable.

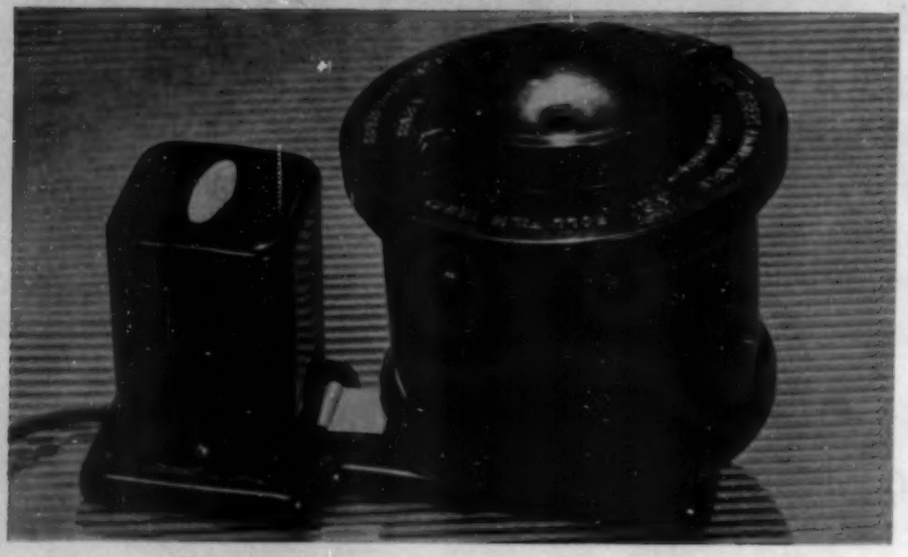
Film developing tanks of molded plastics have during the past two years become a part of almost every amateur's kit. One of the first was the *Photo-See*[4] which, with a camera of the same name, was invented in 1937 by Herman Casler. Records show that more than three years were spent in bringing it to its final

[3] Modern Plastics, August 1938 Page 66.
[4] Modern Plastics, April 1937 Page 27.

Exposure meters as well as cameras have turned to plastics. Weston's* 12, *one of the earliest (1934), housed a photo-electric cell and gage in a two-piece molded unit. The Argus* 15, *a new pocket-size exposure meter, made of acetate by Hopp Press, has a neat leather case with a card listing instructions and speed. No springs, screws, or joints are needed in the construction of Fink-Roselieve's photographic tongs* 13 *which are injection molded in a single piece by Boonton Molding Co. They're fretted, have stops to prevent sliding into trays, and come in black and red to use with different solutions. The See Sharp* 14 *is a focusing device used in making enlargements to magnify the easel image. Made by R. P. Cargille with a base of phenolic molded



16 *Accuracy of molding and smooth surface on the Selectroslide* **16** *allows slide carriers to move easily. This automatic slide changer can be attached to all standard model projection machines. Molded parts are by Remler, Limited*



17 *Roll film developing tank* **17** *designed by Albert Specialty Co. is one of the most recent of the many non-corrosive all-plastic tanks. Pictured also is an automatic electric agitator which has several molded parts*

state of perfection and that the ultimate results were achieved in molded plastics. The manufacture of the tank called for a material which would be free from the effects of developing solution, fix and washing, and would serve as a veritable dark room in itself.

Most recent of this type is that of the Albert Specialty Co. who not only designed a tank made of plastics but is also marketing an automatic electric developing tank agitator which employs the same material for some of its parts. While the two products are available separately, they've been shown together here.

Developing trays have been in such demand that today stock molds[5] produce them by the thousands in almost every desirable size.

Other photographic equipment being molded are daylight film winders, film book cartridges, radial wipes for professional movie cameras, paper cutters, interval timers, slide viewers (for films, too). Toys in the form of film viewers[6] sold fast during the first season, both at the New York World's Fair and at the San Francisco Golden Gate Exposition.

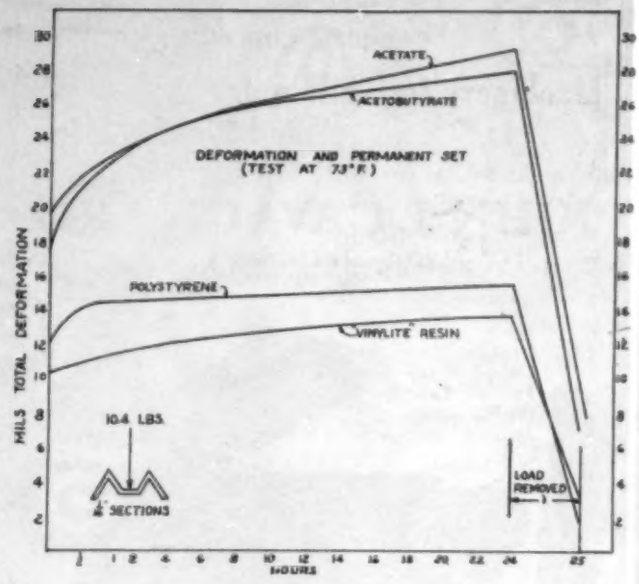
The illustrations accompanying this review reveal the great versatility of plastics for photographic equipment. One finds miniature cameras of almost every conceivable design, candid cameras of several types of construction from the molded outer housing to the solid block type which serves as interior and body. It's small wonder, then, that the query was raised as to why camera and supply manufacturers so long overlooked such wonderful possibilities in plastics. Now that they're used, we have come to take them so much as a matter of course that we really lose sight of the fine work and unstinted research on the part of plastic materials manufacturers and the fine craftsmanship of the custom molders and engineers which have made them possible.

[5] Modern Plastics, July 1939 Page 48.
[6] Modern Plastics, July 1939 Page 42.

New vinyl molding material

(*Continued from page 65*) That is really why it is rigid. Its actual tensile is comparable with the highest of other materials but it will not deform, appreciably, below its rupture point. Consequently, when struck at high impact velocities, the energy is concentrated rather than distributed over a larger area as would be the case with a more elastic material, and rupture can occur. This is a feature to be considered in practical part design and is sometimes overlooked with many plastic applications.

Figures 3 and 4 elucidate this relative impact strength feature on the basis of both an unnotched and a notched test specimen and it is really necessary to consider these two types of tests because of the magnitude of the differences between them. Furthermore, these data are purposely obtained at two temperatures, that is 80 deg. and 25 deg. F., because the relation between the different materials may be entirely different depending on whether one is concerned entirely with room temperature conditions or whether low temperature factors may be involved. It is obvious that the room temperature advantages of the cellulose acetate plastics practically disappear at 25 deg. F. Copolymer vinyl resin, methacrylate, and polystyrene show a much more constant behavior throughout this temperature range, with copolymer vinyl resin consistently topping that group of materials. Whether these data indicating greater impact strength at 25 deg. F. than at 80 deg. F. is actually true, the author is not prepared to say, at least so far as its practical aspects are concerned. It is believed, however, that injection molded articles made of the copolymer vinyl resins are definitely less affected in respect to this property by low temperature exposure than any of the other available materials.



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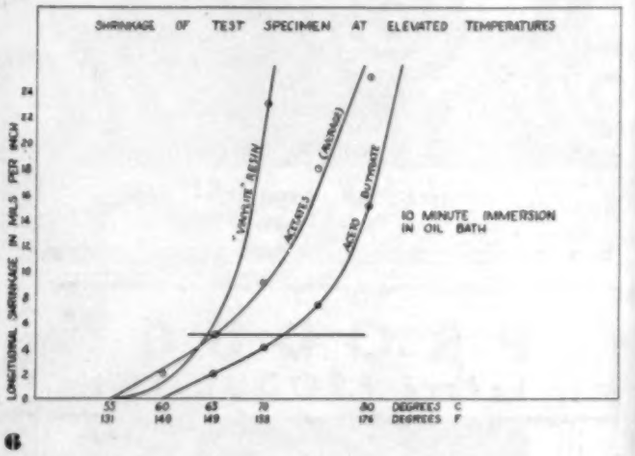

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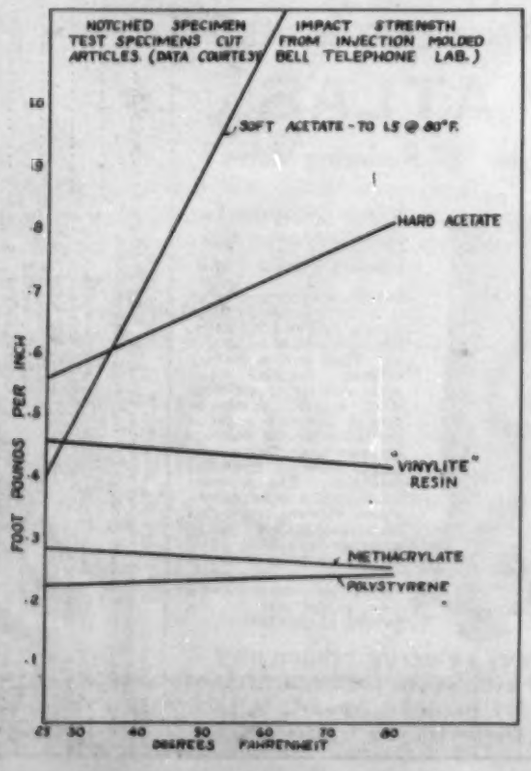

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The property of rigidity deserves further discussion because it is one of the points in which this plastic seems to be in a class by itself. Specimens of *W*-shaped cross section were loaded and the time-deformation relations observed are plotted in Fig. 5. In addition to showing the difference in magnitude of the deformation at instantaneous and constant loading between these materials, the recovery is also shown at one hour after removal of the load. This is an indication of the permanent set taken. The rigidity of the copolymer vinyl resin probably accounts for the fact that it is such a desirable comb material.

The matter of safe operating temperature of injection molded copolymer vinyl resin parts requires some comment. The limitations in this respect with the present cellulose acetates, cellulose acetate butyrate, and polystyrene are well known. Copolymer vinyl resin is only in the class of the acetates as shown by Fig. 6 and its safe usage temperature at present is not in excess of 150 deg. F. This is due to its inherent temperature-plasticity behavior, and when it does soften its plasticity increases rather rapidly. Therefore,

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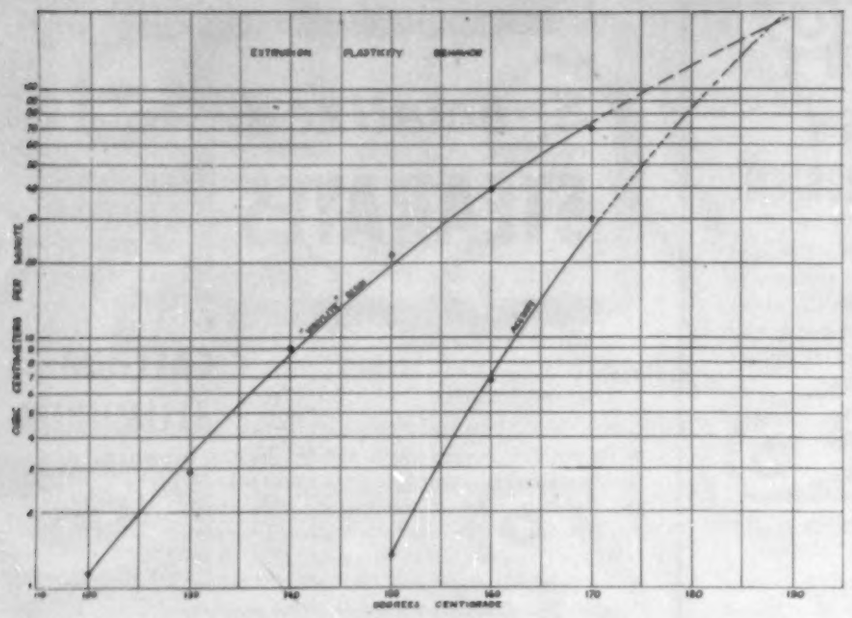

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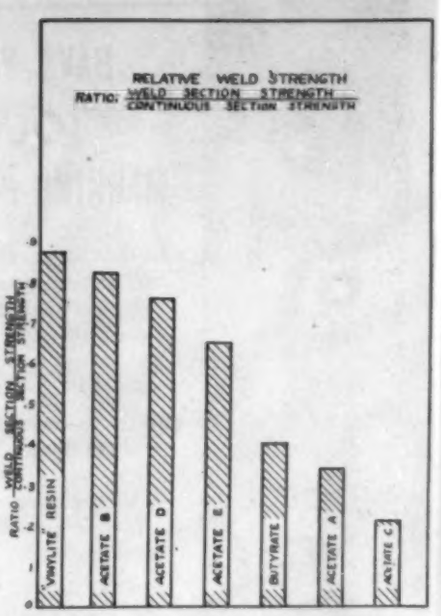

8

at or below a certain temperature it retains its normal rigidity but when that temperature is exceeded the degree of distortion of the copolymer vinyl resins may be worse than with materials which exhibit a broader softening-range distortion behavior.

Another factor enters into this consideration, namely, the effect of color on this heat distortion factor, where the temperature to which the part is raised may be a function of radiant energy absorption. Molded parts, in a closed container under glass and subject to direct solar radiation, have been found to reach an internal temperature of 158 deg. F. for a black article and 144 deg. for a white one with an internal air temperature of only 127 deg. F. In this particular case the black part distorted and the white one did not, simply due to the difference in color energy absorption. This is another instance where a few degrees may make a considerable difference with ventilation and radiation becoming very important secondary factors.

This discussion of the characteristics of copolymer vinyl resin has been primarily from the standpoint of the attraction which these resins may have to the ultimate user of the formed article. There are some features, however, which deserve comment from the standpoint of the molder or producer of the article. One of these is the fundamental difference between copolymer vinyl resins and other thermoplastic materials with respect to flow behavior.

Molders who have been producing acetate and acetate butyrate parts are familiar with the temperatures of about 340 deg. F. and up at which these materials operate. Furthermore, when there has been trouble in filling a mold cavity, the molder has generally raised the temperature to compensate for long gates, difficult filling conditions or what not, by increased fluidity of the plastic. While this is a permissible practice with these materials, it is not with copolymer vinyl resin. The temperature-plasticity characteristics of this material are such that it reaches an optimum flow behavior beyond which there is no advantage with further increases in temperature, and moreover, the compound will not stand such treatment. Owing to the definite differences in the temperature-fluidity relation of copolymer vinyl resin and cellulose acetate, it is hard to show a direct comparison. However, an empirical extrapolation of the curves in Fig. 7 brings out this point of fundamental difference in flow behavior.

The operating temperatures for properly handling this plastic are in the range of 290 deg. F. to 325 deg. F. When the cavity cannot be filled in that range the remedy must be sought in adjustments of pressure, gating or other means. Fortunately, there are relatively few such conditions that have been so far encountered. This temperature feature is an important one and means, in one sense, that there is a potential saving in operating cost, because the combination of temperature, specific heat and gravity factors involved theoretically indicate a heat energy input requirement of about 70 percent of that for commonly used thermoplastic materials. This is confirmed in practice by the use of lower wattage heating elements on resistance-heating type cylinders.

The inherent thermoplastic behavior of copolymer vinyl resins enters into its practical applications in another way. Since it cannot and need not be converted to an extremely fluid state, it does not tend to flash so easily under conditions of insufficient mold closing pressure and yet it retains its optimum flow behavior during egress to the mold sufficiently to permit of accurate filling of very fine cavities. In some instances, especially on thick sections there is a slightly longer time interval in the mold required to cool the casting to a given rigidity, but this can generally be compensated for by cooling in the mold only sufficiently to handle the casting without warpage and then immersing it in water. This is perfectly feasible practice with this plas-

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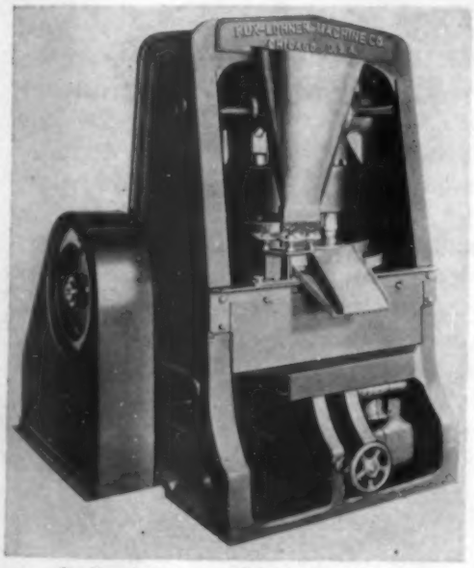

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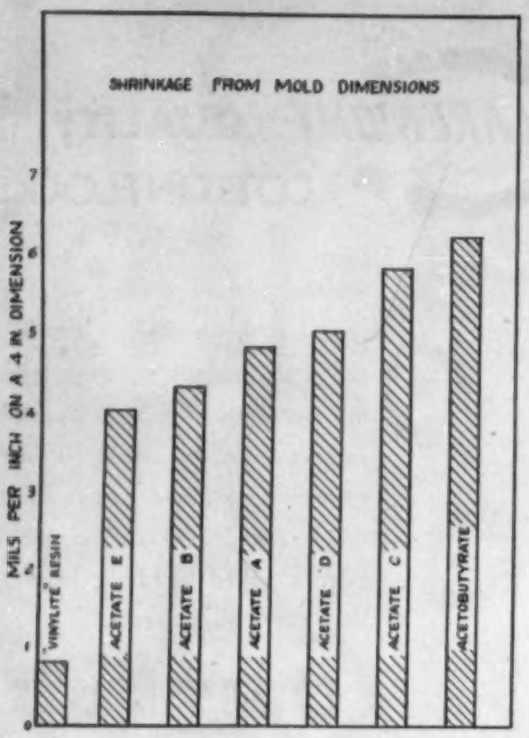

Fig. 9

tic as it does not harm either the surface finish or the casting quality.

Another operating feature that deserves comment is the low shrinkage factor for copolymer vinyl resin between its plastic and its solid phase. This, as shown in Fig. 9, is of the order of 0.001 in. or less per inch and may mean that castings which have ejected satisfactorily with higher shrinkage materials will tend to stick when molded of copolymer vinyl resin in the same mold. Obviously this condition is readily compensated for in mold design and having done so the result is more accurate reproduction of the mold cavity and enhanced surface finish of the casting. Similarly, castings which may involve a shrinkage factor on a core have their extraction simplified with this material because they do not shrink down so tightly on the core member.

This low shrinkage feature becomes important in another way in that it is indicated that it will be possible to produce injection molded castings of appreciably thicker sections than has been possible heretofore, without the hazard of shrink and flow marks that are such common problems. Solid homogeneous sections up to $^{11}/_{16}$ in. thick have already been produced successfully and this feature, in company with the lack of warpage and distortion previously mentioned, is going to open up the possibility of practical castings in both larger areas and greater thicknesses.

While mold and part design will always be of paramount importance in the strength and perfection of castings, it is indicated in Fig. 8 that copolymer vinyl resin, when properly handled, will develop greater weld strength at the junction of two or more paths of flow than some of the other materials.

Some of the reasons for the belief that this material has a legitimate place in the injection molding field have been cited in this paper. This is borne out by the practical experience so far, wherein some one or more of the distinctive properties mentioned has placed the material actually in production in the existing fields of toothbrush handles, combs, novelties, beer scrapers, hair ornaments, etc. In every case there has been some technological justification in the way of chemical resistance, freedom from warpage or distortion, rigidity and strength, accuracy of size control, improved mold finish, or other advantage. Like most things in life, these features are not obtained without some compromise in the way of altered production technique or other mitigating factors. When and if the material is indicated and the molder will follow the recommended procedures he will be well repaid in the way of some quality, production, or economic advantage.

Good tools made better

(*Continued from page 56*) the garage, or even up in the attic, but invariably the home craftsman takes pride in acquiring the best possible kind of tools, and once he has them, keeps them in tip-top shape.

That is one of the reasons why the Millers Falls Co., makers of tools since 1868, has added a de luxe line to its complete assortment of professional tools. A dressed-up collection of tools, snappily trimmed with transparent red plastic handles and knobs. So appealing are they, that amateur craftsmen are willing to pay a little extra to get them.

"We are specifying plastics for handles and trim wherever we can for increased attractiveness and practicability," says K. Y. Taylor, sales promotion manager of Millers Falls Co. "Toolmakers, you know, were among the first to feature color in their products. For years, the Goodall Pratt Co. (which was absorbed by Millers Falls Co. in 1931) imported a special vermilion pigment to beautify the humble working tool. Glossy black and red mahogany stain has been used extensively as a finish for all sorts of tool handles. Now, plastics allow us to use even more color in our tools, and what's more important, they don't chip, crack or fade in service."

About two years ago the company started using plastics for screw driver handles. Today this particular tool is as popular with the artisan as with the amateur in spite of the fact that it is more expensive than a wood-handled driver. And for sound reasons, too. Not only is it durable and capable of outlasting the metal parts if used in the ordinary way, but it has good insulation, is resistant to grease and can be cleaned thoroughly and easily as well. These factors had much to do with the prompt acceptance of the plastic-handled screw driver by the automotive trade where it really started its career. It has gradually been approved by craftsmen in other lines of work until it has achieved excellent distribution in all types of industry.

From time to time, clear red plastic handles and knobs have been added to other tools—planes, bit

Lightweight pocket size torpedo level has a smooth Bakelite housing molded by Watertown Mfg. Company

braces, hack saws, sanding disk cutters and the like. The planes furnish a particularly high spot in any tool window or counter display, for besides sporting plastic handles, they are completely chromium plated as are the bit brace chucks.

"We didn't expect our use of plastics would create any furor in the tool business," explains Mr. Taylor. "Our aim was to develop a de luxe line for a certain class of buyer who would appreciate such tools. Enough have been sold to fully justify our experiment and sales are increasing steadily. We wouldn't think of giving up any of our plastic trimmed tools. They have all been satisfactory from our angle and as purchasing power goes up, we feel sure their sale will follow approaching a fair growth."

One of the Millers Falls Co.'s tools, a torpedo level encased in a smooth, streamlined molded plastic housing, was an award winner in the 1939 MODERN PLASTICS Competition (illustrated on this page).

Looking at patents on molding

(*Continued from page 61*) to avoid injury to the operator or the machine. Claim 1 reads: "A molding press comprising a hydraulically movable heating platen, a stationary head associated therewith, a hydraulically movable cooling platen, a tiltable head associated therewith, and a hydraulically operated adjustable toggle connection operable independently of the movable cooling platen for tilting the tiltable head."

III. Molding special shapes.

1. *Molded screw caps.*

Screw-threaded caps present a special problem in molding; only a few of the pertinent patents can be considered here.

U. S. P. 1,916,692, July 4, 1933 (Reissue 19,000, Nov. 14, 1933) and 1,916,693, July 4, 1933, Geo. K. Scribner, assignor to Boonton Molding Co.). Taking advantage of the discovery that phenolic resins, in the molding operation, pass through a stage in which the resin is still hot but is set sufficiently for removal from the mold while yet retaining an elastic state quite different from the subsequent hard rigidity, molded screw caps are stripped directly from the mold. By permitting removal without unscrewing the caps, yet without destroying the thread in the stripping operation, the mechanical aspects of molding are greatly facilitated. A particularly important advantage of direct stripping from the mold is that caps can be molded with a liner recess, a feature which was heretofore practically impossible. Thus cork or similar liners are securely held from falling out of the cap. The claims of U. S. P. 1,916,692 (Reissue 19,000) specifically cover the new method of molding and stripping, while the claims of U. S. P. 1,916,693 are directed to caps molded with a liner recess.

U. S. P. 1,944,571, January 23, 1934, Walter E. Rahm (assignor to Plastic Products Engineering Corp.). This invention provides automatic means for unscrewing a number of molded screw caps simultaneously without handling and without removing the molds from the press. This eliminates the expensive operations involved in removing the heavy molds from the press for removal of the caps, and speeds up production.

2. *Pencils.*

U. S. P. 1,937,104, November 28, 1933, J. E. Thomsen (assignor to Joseph Dixon Crucible Co.). According to this invention a self-hardening pencil lead (either a graphite composition for black or a colored composition) and a self-hardening sheath are extruded together from a suitable press. The product is fully equal to wood sheath pencils made with a prehardened lead.

U. S. P. 1,959,288, May 15, 1934, John P. Lynn (assignor to Dur-O-Lite Pencil Co.). According to this invention pencil bodies are molded in a single operation from a phenolic resin molding powder, in a mandrel held between two dies. Bushings are forced into the pencil bodies while they are still plastic, before they are released from the forming dies. This prevents any inaccuracy in the position of the bushing.

3. *Wheels.*

U. S. P. 1,843,906, February 2, 1932, Grant E. Smith (assignor to Pouvailsmith Corp.). In making molded automobile steering wheels the necessary blanks were formerly made by bending and jointing blocks of material, or by winding laminated material into shape, but production was tedious and expensive. This invention provides for compacting blanks from a loose mass of pulp, shavings or shredded sheet material in a blanking press, then placing the resulting monolithic blank in a press for hot molding. The material for the blank is preferably impregnated with a phenolic resin. A metal reinforcing core, properly embedded in the material, gives strength and rigidity to the wheel.

B. Laminating

U. S. P. 1,942,251, January 2, 1934, Gerald H. Mains (assignor to Westinghouse Electric and Mfg. Co.). Uneven thermal expansion and contraction of the platens and press castings in a laminating press, formerly a serious obstacle to the production of smooth, flat laminated products, can be prevented by the improved press disclosed and claimed in this patent. By fitting the top and bottom castings of the press with cooling

plates, and by providing pads which are superior to any previous pads in that they are effective both as heat insulators and as cushions to absorb irregularities in pressure or contour, the undesirable effects of improper or uneven heat transfer are overcome. An inch or two of soft cloth padding, or a greater thickness if temperatures above 212 deg. F. are employed, provides the cushioning function while a facing of asbestos gives the necessary thermal insulation.

U. S. P. 2,137,634, Nov. 22, 1938, L. T. Sutherland, (assignor to Barrett Co.). This invention relates to forming continuous lengths of laminated sheet material in a press by successive operations along the length of the sheet. The improvement, disclosed in the specification and defined in the claims, comprises inserting resilient plates between the platens of the press but extending beyond the platens. When a resin-impregnated sheet of fibrous material is cured in this press there is no sudden drop of pressure and temperature at the edge of the platens, but a gradual decrease extending into the area covered by the next adjacent position in the press. Thus press marks are avoided and the irregularities in cure, encountered in previous presses, are smoothed out so that the sheet has uniform physical properties along its length.

C. Injection molding

U. S. P. 1,810,126, June 16, 1931, Hermann Buchholz (assignor to W. D. Grote). This invention provides an improved machine for injection molding of cellulose acetate or like thermoplastics, at higher production speeds than were hitherto attained and yet without using multiple cavity molds. Very rapid setting of the plastic is achieved by chilling the mold.

U. S. P. 2,080,783, May 18, 1937, A. E. Petersen (assignor to Celluloid Corp.). This invention is also designed to improve the molding of cellulose acetate or the like. The single claim reads: "Process for the injection molding of articles in a substantially continuous manner, which comprises moving a plurality of chambers around a circuit, charging each chamber with a thermoplastic material at one part of the circuit, heating the charge in each chamber over another part of the circuit, and at a further part of the circuit extruding each charge under pressure through a narrow passageway into a mold space."

U. S. P. 2,111,857, March 22, 1938, H. L. Jeffery (assignor to Grotelite Co.). An automatic injection molding machine which introduces several improvements into the molding of cellulose derivative plastics is disclosed and claimed in this patent. It handles the hot thermoplastic at the optimum temperature and pressure for high speed production of accurately molded shapes, and is readily adjustable to a different set of conditions when the plastic composition is changed. Improved feeding and injecting devices are provided, with efficient control of temperature and plasticity while avoiding wastage of material. The ejector mechanism is also improved in speed, adaptability and maintenance of quality in the product.

U. S. P. 2,115,590, April 26, 1938, Chas. D. Ryder (assignor to Grotelite Co.). The particular improvements contributed to the injection molding art by this invention relate to mold-locking mechanisms which are positive in action, even against comparatively high mold pressures. The new mechanisms are especially designed for those elaborate automatic molding machines having a variety of movements for different mold parts, a notable advantage being that when one or more of these movements are idle with respect to operating mold parts they may be utilized for operating the mold locking device.

U. S. P. 2,174,319, September 26, 1939, Hans Gastrow (assignor to Franz Braun Aktiengesellschaft). Thermoplastic molding powders are efficiently and economically molded without being actually melted in the preheating chamber, according to this foreign invention. Claim 1 reads: "The method of molding thermoplastic materials such for example as cellulose acetate or polyvinyl compounds which comprises introducing the thermoplastic material to be molded in granular form into a preheating chamber, preheating said material at a temperature lower than that required to produce fusion thereof, the while agitating the same and discharging said granular preheated material into a molding cylinder."

D. Extrusion

U. S. P. 2,047,554, July 14, 1936, Ernst Fischer (assignor to Siemens-Schuckertwerke Aktiengesellschaft). To overcome the brittleness of polystyrene or polyvinyl resin thermoplastics sufficiently to permit formation of thin-walled tubing the elasticizing effect of stretching is utilized. A thicker walled tube, narrower in diameter than the final tube, is first extruded from a press. The walls are then stretched and expanded against a mold by forcing compressed air into the tube. Extrusion may be facilitated by a forced feed device of the caterpillar tractor type, or by using a lubricant which will not react with the thermoplastic.

U. S. P. 2,121,966, June 28, 1938, C. C. Jacobson (assignor to John Robertson Co.). Successful application of the extrusion technique to thermosetting rather than thermoplastic resins is claimed in this patent. The method disclosed for the purpose is applicable to formation of rods or tubing and comprises extruding a hollow sheath of a soft, fusible metal (preferably lead) from a press while simultaneously extruding into the sheath a thermosetting resin. The plastic is cured while in the sheath, by heating in a hot gas or in a hot water or oil bath. The sheath may be sealed by construction at suitable lengths, or long lengths may be wound on a reel and cured thereon. For tubes a core, which may be of the same material as the sheath, or different must be extruded and suitably spaced inside the sheath so that the plastic may be extruded around the core.

U. S. P. 2,177,658, October 31, 1939, J. S. Kimble and E. C. Blackard (assignors to Eastman Kodak Co.); also *2,177,660,* same date, to *J. S. Kimble, E. C. Blackard and J. S. McCellan.* These two patents relate to con-

tinuous extrusion of tubing or sheeting of cellulose acetate or a like plastic under conditions which preserve uniform density and dimensions. For tubes a plastic composition containing no volatile solvent is employed; it passes from the pressure cylinder through a screw conveyor which is cooled at the input end, then to a heated screw conveyor and through the extrusion die. For uniform, low shrinkage sheeting the sheet emerging from the die is supported by gas pressure and is passed through the curing stage under conditions which do not subject the sheet to tension. By this expedient residual strains are eliminated. Claim 5 of U. S. P. 2,177,660 reads: "In apparatus for the production of thermoplastic sheeting, an extrusion die, means for forcing a constant amount of organic thermoplastic material through the die to form a sheet, gaseous means for supporting the extruded sheet and for preventing condensation of fumes on the apparatus, means for conducting the sheet from the die without exerting substantial tension thereon, means for alternately heating the sheet while under substantially no tension, means for calendering the sheet intermediate said heating."

Translucent phenolic laminate

(*Continued from page 66*) special resins need be used for color effects, whereas the core stock may be a plastic material of another type.

A wide range of filler stocks can be used such as krafts, rope and rag-type papers, canvas, various lawn fabrics, sisal and jute fibers. Thick materials such as pulp and kraft boards, roofing felt, and sisal fiber can be impregnated and molded in one piece.

Stability of color depends on the choice of coloring matter. The natural translucent laminate can be made in any color of the rainbow. Attractive opaques from white through pastels and dark colors to black have important decorative and industrial uses.

Five resins, of which "A" was Catavar No. 100 and "B" was Catavar No. 103, were made up into $^1/_8$ in. laminated sheet stock samples using kraft paper 0.011 in. thick (see Table I). All were pressed for same length of time, 40 minutes, at 1000 lbs. per square inch. The grain of paper in the panels was not cross lapped. Hence, test pieces could be tested either with or across the grain. A finished specimen of each panel was tested for physical properties according to A.S.T.M. Specifications. For Table I, one 12 in. by 12 in. by $^1/_8$ in. specimen was made for each panel;

TABLE I. DATA ON RESIN CONTENTS AND PRESSING TEMPERATURES OF THE LAMINATES

Resin Sample	Resin Content	Volatile Content	Press Temperature
A	45.0%	4.0%	138° C.
B	39.3%	4.0%	138° C.
C	47.1%	4.0%	142° C.
D	47.8%	4.0%	142° C.
E	50.8%	4.0%	142° C.

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FOR SALE: Plastic & Molding equipment. Rebuilt and Guaranteed. Large stocks Hydraulic Presses, Pumps & Accumulators. Preform Machines Rotary Cutters, Mixers, Grinders, Pulverizers, Tumbling Barrels, Drill Presses, Lathes, Gas Boilers, etc. Send for Bulletins 146 and 128. We also buy your surplus machinery for cash. Reply Box 335, Modern Plastics.

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Artist, modelmaker, designer, widely experienced in ornamenta and sculptor modeling, woodcarving, patterns for plaster, composition, ornam. cast iron, etc.—develop new ideas, colored sketches, lettering, advertising novelties. Would like position with plastic molding or similar concern. Reply Box 345, Modern Plastics.

●

SYNTHETIC PLASTIC AND RESIN CHEMIST now available. Fifteen years experience in the production and application of thermosetting and thermoplastic resins. Comprehensive research experience and a record of achievement. Prior art surveys, patent analyses and evaluation. Ph.D. Reply Box 346, Modern Plastics.

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FOR SALE: 2 Watson-Stillman 4-cylinder opposed Hydraulic Pumps, 5000 lb. PSI, 25 GPM, motor driven, 100 HP AC motors; 7 Gould Triplex Hydraulic Pumps, 3 1500-PSI, 35-GPM, 4 3000 PSI, 18 GPM: 6-24" x 24" Hydraulic Presses, 12", 14" rams: 2—30" x 30" Hydraulic Presses, 14" rams; 60" Mixing Rolls; 2—300 gal. Nickel Agitated Jacketed Vacuum Stills; Watson-Stillman Hydro-Pneumatic Accumulator, 8" ram, 48" stroke, 42" air cylinder, 5000 lb. PSI, complete with high pressure air received and inter-connecting fittings. Reply Box 339, Modern Plastics.

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WANTED: CELLULOSE ACETATE SCRAP, unground or reground, as well as lumps, also acrylic or methacrylic resin scrap and celluloid scrap. Send details concerning quantities and price. Reply Box 318, Modern Plastics.

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SALESMAN: Experienced in retail and industrial contacts desires Middle West connection with representative processor or manufacturer of seasoned products. Commission basis preferred. Reply Box 347, Modern Plastics.

●

FOR SALE: Mold for streamline housing 5" diameter, 7 1/2 overall, made by Fortney Mfg. Co. Used only for 300 heatings. Offered at great sacrifice. Reply Box 348, Modern Plastics.

●

Young man, 18 years old, wants position. Has natural talent for making models. Vitally interested in plastics. Has had some training. Starting salary immaterial; wants opportunity. Reply Box 349, Modern Plastics.

For Table II, five specimens or more were taken from each panel for each test and the average results were reported in each instance. The results of these tests are shown in Tables II, III and IV.

TABLE II.—STRENGTH PROPERTIES OF THE LAMINATE

Resin Sample	Tensile Strength Lbs./Sq. Inch With Grain	Tensile Strength Lbs./Sq. Inch Against Grain	Flexural Strength Modulus of Rupture With Grain	Flexural Strength Modulus of Rupture Against Grain	Modulus of Elasticity in Bending With Grain	Modulus of Elasticity in Bending Against Grain
A	14,706	10,402	26,223	16,582	936,567	494,520
B	18,399	14,665	25,719	13,996	594,411	314,702
C	16,727	12,516	24,010	22,036	387,160	350,822
D	15,513	10,770	11,312	9,311	131,341	141,828
E	14,692	10,697	16,244	19,783	280,976	312,098

TABLE III.—WATER ABSORPTION TESTS

Resin Sample	Percent Absorption 2 hours	Percent Absorption 24 hours	Grams/Sq. Cm. 2 hours	Grams/Sq. Cm. 24 hours
A	0.122%	0.499%	0.00023	0.00094
B	0.307%	1.556%	0.00050	0.00259
C	0.548%	3.025%	0.00103	0.00586
D	0.263%	1.599%	0.00055	0.00337
E	0.832%	5.266%	0.00139	0.00921

TABLE IV.—IMPACT (IZOD) STRENGTH TESTS

Resin Sample	With Grain Ft. Lb./Sq. In.	Against Grain Ft. Lb./Sq. In.
A	1.755	1.475
B	2.023	1.868
C	2.500	2.167
D	1.562	1.480
E	1.715	1.520

Typical applications of these light-colored laminates include: Translucent laminates—instrument and other dials, venetian blinds, charts and maps, lighting fixtures and displays, tubes; Industrial laminates—breaker strips, molded refrigerator doors; Decorative laminates—table tops and wall boards.

Another type of laminate involving the use of these liquid resins is resin-bonded wood.

Data on the properties of plywood made with liquid resin were presented in the April 1939 issue of MODERN PLASTICS, pages 46 and 48. Because of their unusual hydrophilic character and good bonding strengths, these resins have also found uses in other fields, for example, binding cork granules for water-proof gaskets and binding grit for abrasive wheels.

Sorry—

OUR BLITHE ANNOUNCEMENT IN LAST MONTH'S issue that products could be shown in the Displamor Exhibit Lounge at the New York World's Fair 1940 for $350 the entire season is an error, according to the director of the Displamor Division. The regular contract price for the season is actually $450. Excuse it please!

In describing the Nicholson File Box which won recognition in the All America Package Competition, we said the plastic used was Tenite. It turns out now that only the orange top of the box was Tenite; the bottom was black Lumarith, a similar material made by the Celluloid Corporation.